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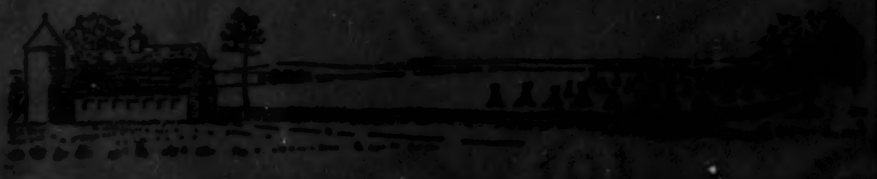

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The Farmer's Digest

Volume 15 March, 1952 Number 9

Cheaper Beef Gains

Condensed from the Breeder's Gazette

Dr. W. M. Beeson
Professor of Animal Husbandry, Purdue University

TODAY a new concept has been developed in the feeding of cattle. It appears we have only started to explore the possibilities of converting roughages and corn into beef.

The big improvement we look for in efficiency of beef production will come primarily through learning how to convert high cellulose feeds—such as cornstalks, soybean straw, oat straw, corn silage and grass silage—into a highly efficient growing and fattening ration.

At present a large proportion of these roughages is being wasted. In order to feed ruminants properly on roughage such as corn silage, a supplement must be designed that contains adequate nutrients to nourish the billions of bacteria which exist in the rumen or paunch of cattle to break down indigestible roughages into usable form.

No doubt the same principles can be used in making more efficient use of many other roughage feeds such as sweet corn refuse, peavine silage, sorghum silage, canning refuse, popcorn cobs, cottonseed hulls, and dry range forage.

Here at Purdue we have combined a group of nutrients in our "Cattle Supplement A," which is unusually effective in balancing the deficiencies inherent in roughages. The combination has permitted good growth and efficient gains at a cheap cost.

Two years of experimentation has shown rather conclusively that feeding 3½ lbs. of this supplement per steer daily, along with all of the corn silage that steer calves would consume (37 lbs.), resulted in a gain of 2 lbs. or more per head per day at a cost of 15 cents per pound.

No hay or other dry roughage was fed. Contrary to accepted

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Louisville, Kentucky, November 1951

opinion cattle can be grown at a rapid and efficient rate without feeding dry roughage in the diet, when silage is properly balanced. No scouring or looseness occurred.

The most striking feature of this experiment was the number of pounds of beef produced from an acre of corn silage (70 bu. corn, or 15 tons silage/A.). The supplemented corn silage produced from 1,600 to 2,000 pounds of beef per acre! After deducting the cost of the supplement and the cost of putting up the silage, an acre of corn produced a return of $385. This figures out $5.50 per bushel for the corn marketed through the cattle. (The cattle price used to establish these figures was 30¢, a conservative figure because the steers were worth considerably more.)

Purdue Cattle Supplement A

	In 1000-lb mix
Soybean Oil Meal	643.1 lbs.
Molasses Feed (45%)	285.8
Bonemeal	51.4
Salt	17.2
Vitamin A and D Concentrate	2.5

Feed 3½ lbs. daily per steer. With soybean oilmeal @ $4.45 a cwt., molasses @ 4¢ a lb., bonemeal @ 5½¢, salt @ 1½¢, and codliver oil @ $4.50 a gallon, that is going to cost about 15¢ a day per steer.

Half of the nutritive value of a corn crop from an energy standpoint is in the corn kernel *and the other half is in the cornstalks, corncobs and leaves.* Probably one of the fundamental reasons why corn silage has never given as good results in previous years is because we have not had the know-how to balance its deficiencies.

Similar results were obtained from grass silage which had been put up with the addition of 200 lbs. ground corn per ton of green silage. 480-lb. calves fed all of the grass silage they would eat (37 lbs. per head daily) along with 3½ lbs. of Purdue Cattle Supplement A, gained 2 pounds a day and the cost of the gain was 18 cents a pound.

With this supplemental feeding program an acre of grass silage produced 1,432 pounds of beef per acre from the first crop—and still we had ample pasture left on the field for the remainder of the grazing season. In dollars and cents after deducting the cost of the supplement, the cost of corn used for a preservative and the cost of putting the silage into the silo, this acre of grass silage made a net return of $246 per acre.

Ensiling is the best and most practical method of preserving the original nutrients in a roughage crop such as hay or the corn plant. We think grass silage should be field chopped into a truck or wagon and put right into an upright, trench, or surface silo as soon as possible. Wilting defeats the purpose of making grass silage in all types of weather, rain or shine, and requires more labor.

Since grass contains so much moisture (75 to 80% water) it is recommended that 130 lbs. of ground corn cobs, or some other

dry roughage such as chopped straw or hay, be added to each ton of fresh green material. You also need a preservative of either 100 to 150 lbs. of grain (corn, wheat, barley, sorghum or oats), 80 lbs. of molasses or 100 lbs. molasses feed per ton. Remember a preservative does not lose its feeding value added to silage.

The addition of dry roughage such as corn cobs prevents excessive seepage and loss of water-soluble nutrients from the silage. We had excessive run-off with the alfalfa silage prepared for our first experiment (1950) but this summer we used the method described above with little or no loss of juice.

When corn cobs, oat straw or soybean straw were fortified with our Cattle Supplement A at the same rate of 3.5 lbs. per steer daily, the cattle gained respectively 1.50, 0.93 and 0.78 pounds daily. The feed cost of the winter gains was 16¢ on cobs, 21¢ on oat straw and 33 cents per pound on soybean straw. The lowly corn cob has been raised from a feeding value which was practically nil to a valuable source of energy for roughing and growing cattle through the winter. With this feeding program it requires about a ton to 1½ tons of cobs to winter a steer.

It appears from our data that we have only scratched the surface in exploring the possibilities in converting roughages into beef. We should be able to almost double our production of beef cattle in the midwest by a "balanced feeding" of the many roughage crops that now go to waste.

Although we cannot yet give you experimental evidence, it is logical to assume that the same principle of balancing roughages can be applied to fattening lambs and for feeding breeding ewes. Sheep are ruminants, and should respond similarly to a formula which will meet the requirements of the bacteria and other microflora in their rumen and digestive tract, as well as furnish the nutrients for efficient production of lamb and wool. (*From an address before the 46th annual meeting of the American Meat Institute.*)

New Process Makes Vitamin B_{12} Feed Supplement

A new commercial source of vitamin B_{12} for supplemental use in feeds is now available to feeders and the feed industry as a result of recent research by USDA at its Western Regional Research Laboratory. The supplement is the result of fermentation of sugar-containing by-products such as sugar-beet molasses (along with other nutrients) by selected strains of Bacillus megatherium. The product is a light tan, malty flavored powder that combines easily with feeds.

—*Marketing Activities*

Calf Scours Controlled

Condensed from American Agriculturist

Jim Hall

ONE out of five calves dies before it's a year old and most of them die from scours and pneumonia. That isn't news, but it is news that calf losses can be reduced to a point where you'll probably lose only one in twenty!

This claim is based on results of many experiments at a half-dozen state agricultural colleges with aureomycin in calves' diets. A great variety of diets were used in the experiments, ranging from whole milk to calf starters and milk substitutes of various kinds, but in every case the addition of aureomycin cut down scours substantially.

In some of the feeding experiments at the University of Vermont, Kansas State College and Louisiana State University, calves getting this antibiotic didn't have any scours at all, even though others on the same diet but without the aureomycin had diarrhea for an average of several days each.

In a Kansas test from birth to 12 weeks of age, 11 calves that received the aureomycin were almost completely free of scours and colds, but of 11 similar calves used as controls, only one went through the first 12 weeks of its life without one or the other. Eight of these untreated calves suffered medium to severe scours or colds. Seven had both colds and scours. One died.

But controlling scours is not the only thing this antibiotic does. It's a double-barrelled shot-in-the-arm for more profitable dairying —the tests show that it boosts the rate of weight gain in young calves, too!

Dr. Hugh Riddell, head of the dairy husbandry department at the University of Vermont, reports that calves fed aureomycin in their diet gained 12% to 14% more than similar calves getting none. The 15 Holstein, Ayrshire and Guernsey calves in the test received whole milk from birth to one month, followed by skim milk to 12 weeks, together with a commercial calf starter and good quality hay. With the aureomycin in the diet, the calves averaged to exceed normal growth by 38 pounds.

In the Vermont test, not one case of scours was observed. Now additional Vermont tests are be-

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Ithaca, New York, January 5, 1952

ing made to find out just how good aureomycin is as a scour preventative in private herds.

Rate-of-growth tests conducted so far indicate that adding the antibiotic to the diet stimulates growth very much in young calves but that after about 34 weeks of age, the calves not getting aureomycin gain at about the same rate. However, calves that got the extra growth maintain it even after the aureomycin is removed from the diet.

At Cornell, tests from birth to 8 weeks were conducted with 39 pairs of calves on a variety of diets including whole milk and several different milk substitutes. Those getting aureomycin increased their rate of gain 20%. In these tests, on all diets, calves without aureomycin had scours an average of 6.9 days; with it, the average was only 2½ days. On the whole milk diet the control calves averaged 7½ days with scours and the ones with aureomycin averaged only a fifth of one day with scours.

Best results have been obtained when the antibiotic was added to the diet soon after birth. Calves not given it until they were 14 weeks of age gave excellent growth response until they were 26 weeks old, but by the time they were 34 weeks, the rate of gain was the same in groups with and without the antibiotic. N. L. Jacobson of Iowa State College found that calves fed aureomycin until 16½ weeks old, weighed 236 pounds and the control calves only 193—a 22% increase in weight.

L. L. Rusoff, dairy nutritionist at the Louisiana State University, sent me the results of various experiments conducted there. In one test by Rusoff and A. V. Davis, 24 purebred Jersey and Holstein newborn calves were divided in groups for tests. At 16 weeks those getting aureomycin had had an average daily gain of 1.4 pounds while the control groups average gain was 1.19 pounds. The amount of feed consumed per pound of weight gain was about the same.

Of another test Rusoff said, "After four weeks the calves receiving aureomycin had a smooth hair coat and sleek solid muscular appearance while the others were rougher in appearance and had a larger middle."

In other weight-gain tests at Kansas, calves on aureomycin from 8 to 12 weeks of age gained ⅓ pound more a day. At Pennsylvania State College, groups of Holsteins from birth to 12 weeks had an average daily gain of 1.29 pounds without the antibiotic and 1.57 pounds with it.

Encouraging to dairymen is the fact that we're not going to have to wait several years before aureomycin products are available for our calves. This antibiotic and

several others have been used for some time in poultry and hog feed with results that Dr. Hugh Riddell of Vermont University calls "one of the most striking advances in modern livestock feeding."

Tests show that aureomycin reduces scours, increases weight gain rate, improves physical appearance of calves and has no harmful effects even with large overdoses. It's a safe bet that you will be able to get calf starters and milk substitutes containing aureomycin within a month or two.

Many tests are being carried on with other antibiotics to check their effect on scours and calf growth and there are bound to be interesting discoveries. However at present aureomycin seems to be the outstanding antibiotic. The product containing it, which is used for mixing with calf feeds is called Aurofac.

Antibiotics (the major ones are penicillin, aureomycin, terramycin, streptomycin and chloromycetin, but more than 300 have been named since the discovery of penicillin) are produced by a fermentation process and the residue from the process contains some of the antibiotic as well as Vitamin B12. Aurofac is made from the residue of the aureomycin fermentation process.

Soil Fertility and Pastures

Condensed from Better Crops with Plant Food

Dr. Firman E. Bear
Soils Department, Rutgers University

A GREAT many other intelligent dairy farmers on hilly land have come to realize that plowing and cultivating are enemies of the soil. They have found that corn on a dairy farm is parasitic on the grass-legume forage crops that are needed in much greater quantity and in much higher quality for economic milk production.

My first experience in improving grassland was in West Virginia some 35 years ago. In those days, W. D. Zinn, a prominent farmer, institute speaker, and part-time county agent, was advocating the use of limestone and superphosphate as a means of increasing the productivity of permanent bluegrass pastures. Where the topography of the land permitted, disking and reseeding with grasses and clovers were rec-

Reprinted by permission from Better Crops with Plant Food, Washington, D. C., December 1951

ommended. The effects were often phenomenal.

But the rate at which his suggestions were applied never attained any great momentum. Most of the pastures in West Virginia were being used for the production of beef cattle on which the profit margin was relatively small. Also, it was soon found that more than limestone, superphosphate, and reseeding were required to get and keep a stand of clover.

In Europe, carefully-saved manure and basic slag have long been used to excellent effect on permanent pastures. The manure serves primarily as a source of nitrogen and potassium and the basic slag supplies lime and phosphorus. Both materials are important sources also of the minor elements that are missing over large areas of pasture land.

It was not until the end of the first World War, when the produce of the tremendous nitrogen-fixing factories of Germany and England was diverted from explosives to agriculture, that really intensive systems of pasture management came into being. One such system, which added heavy use of nitrogen fertilizers and rotational grazing to the program, had been started at Hohenheim, Germany, in 1917. This system, fostered by the Stickstoff Syndikat in Berlin and by Imperial Chemical Industries in London, began to receive serious consideration in this country about 25 years ago. The first experimental project of this type in the United States was put into operation at the Dairy Research Farm at Sussex, New Jersey, by Bender in 1927, where it has been in effect ever since.

Notwithstanding the known values of lime, complete fertilizers, improved strains of grasses and legumes, and rotational grazing, progress in pasture improvement and management has been distressingly slow. But the "Green Pasture" program, which is being fostered by the Extension Services of the several Northeastern States, has resulted in getting large numbers of farmers alerted to the possibilities for profit in improved grasslands.

In New Jersey, stress is laid on having uniformly good grazing from early April to late November, a period of more than 200 days. The program includes the use of winter grains for early spring and late fall pasture, rotational grazing of bluegrass-white clover swards, and the growing of orchard grass-ladino clover, sudan grass-soybean, and bromegrass-alfalfa mixtures for in-between grazing and hay purposes. Various other forage plants, such as Reed's canary grass, sweet clover, and birdsfoot trefoil are also used.

In dealing with these pasture-management problems, I have

reached certain conclusions. Some of these are supported by exact experimentation of my associates and myself, some are based on studies of scientific developments in related fields of research, some are the result of field surveys, and some have come from conversations with pasture specialists in this country and abroad.

Recently there has been considerable discussion of bluegrass as a weed that should be replaced by improved grasses and clovers on dairy farms. But bluegrass is seldom given an opportunity to demonstrate its real value, being usually grazed continuously from early spring to late fall. Furthermore, the native white clover, which grows here and there and comes and goes from one year to the next, is expected to supply all the nitrogen the grass requires.

The falsity of the concept that the clover will supply the necessary nitrogen to the associated bluegrass is readily apparent following an application of a nitrogen fertilizer. If one wants really good bluegrass pastures that start off early in the spring, extend well into the summer, and come on again with luxuriant growth in the fall, he should, in our experience, give them the equivalent of 500 pounds 10-10-10 fertilizer an acre every year. A second application of 50 pounds nitrogen after the first grazing will aid in extending the grazing further into the summer and bringing it back earlier in the fall. The protein and mineral content of such pastures leaves little to be desired.

If bluegrass-white clover fertilized pastures are grazed as they should be, which means close grazing followed by a resting period and clipping with a mower, clover stands can be maintained at as high levels as they would have been if no nitrogen had been applied. If available, a 5-ton-an-acre application of manure, supplemented by 50 pounds each of phosphoric acid and potash, will accomplish the same purpose and increase the stand of clover. After such manuring at our Dairy Research Farm, the white clover coverage was 25, 44, 41, and 54 per cent for four successive years.

There is abundant evidence that poor bluegrass pastures can be greatly improved by the use of some of the more modern implements that stir up the old sod without turning it upside down. The efficiency of such machinery has been greatly increased. Poor hillside pastures of any type can be very quickly improved by this process when accompanied by liming to pH 6.0 to 6.5, fertilizing with 500 pounds of 10-10-10, and reseeding to grass-legume mixtures. The nitrogen is usually needed to overcome the competition of the soil microorganisms that work on the old sod.

Our orchard grass-ladino clover

lowland pastures have produced at the rate of 5,500 pounds dry matter an acre, following the regular use of lime and the annual application of 250 pounds 0-20-20. Better results would have been obtained by doubling the potash, and that is our recommendation.

Yields can be stepped up still higher by the application of larger amounts of fertilizer or by the supplemental use of manure. The potentialities of dry-matter production in grass-alfalfa mixtures at New Brunswick were found to be nearly 10,000 pounds dry matter an acre annually over a 2-year period following seeding. This was on well-limed soil that received the equivalent of 1,000 pounds 0-12-12 fertilizer and 25 pounds borax an acre annually.

Quality of produce tends to deteriorate with increasingly high yields above a reasonable level. This is due in part to the higher proportion of stems to leaves. Quality also tends to be lowered from one year to the next. This is because of the soil's dwindling capacity to deliver enough of both the major and minor mineral elements to the forage plants to meet the needs of the animals that consume them. As the pH value of the soil begins to drop, beginning with the first year after seeding, the availability of all the minor elements, except molybdenum, tends to increase. The manganese content of alfalfa was higher each year over a 3-year period. But the cobalt content fell successively from 0.12 to 0.08 and 0.07 parts per million dry matter, and zinc from 0.58 to 0.33 parts per million by the second year.

Special attention is called to the potassium problem. The soils of most permanent pastures have been badly robbed of this element over the years. When it is finally added, a large part of that applied is often fixed by the soil. This fixed potassium is held much more tightly than that adsorbed in the exchange complex. In other words, to get the effect desired, very heavy applications may be required until the potassium level of the soil has been materially raised.

Orchard grass was found to contain one per cent more potassium than the legumes that are associated with it. Similar findings have been reported with bluegrass and bromegrass. Crabgrass, dandelions, shepherd's purse, and dock have very high potassium-accumulating powers, often containing from two to three times as much of this element as the alfalfa associated with them. One of the most important causes of the disappearance of white clover in bluegrass pastures is the competition for potassium that is provided by the grass and weeds. Similar troubles are experienced in grass-legume hay mixtures.

It is generally assumed that fer-

tilizers can be applied to pastures to equally good effect at any convenient season of the year. It is too bad this is not true, since we need to distribute farm and factory labor over a larger part of the year. And, it is much easier to get over the land in summer and fall than in early spring. But in a 5-year test of nitrate of soda and sulfate of ammonia on permanent pastures at New Brunswick, the yields were 36 per cent greater on the average from March applications than from those in October. In similar comparisons of a phosphate-potash mixture, the yields were 22 per cent higher from the March applications.

At reawakening time among the soil microorganisms each spring, there is need for extra nitrogen and phosphorus, elements that are found in very high percentages in their cells. Some bacteria have been found to contain over 10 per cent nitrogen and 2 percent phosphorus. Such microorganisms offer serious competition against grass and clover for these and other elements in early spring.

Use of the airplane for distributing fertilizers will aid greatly on the rougher lands. It appears likely that anhydrous ammonia, applied by the use of a combination tillage implement and gas applicator, may enter the picture. Certainly both practices will be given extensive trials on the more rolling pasture lands in the northeastern part of the United States and they may well spread over large grazing areas farther west.

The general tendency to assume that weeds have negative value in pastures is of doubtful validity. It is well known that they add variety to the diet in terms of both mineral and digestible nutrients. Fertilized weeds of many species make good grazing, and cows mow them down with the grass and clover. The essential point is to keep them growing luxuriantly. The answer to the problem of tall-growing and coarse weeds, as well as clumps of tall grass around dung heaps and urine spots, lies in the regular use of a mower. Interestingly enough, such mowings are often readily consumed by animals, until such time as they become moldy from rain or dew.

One does not care to advocate sowing weed seed. Instead, it appears desirable that more attention be given to introducing a greater number and variety of species of plants into our forage-crop mixtures. Certainly the chances of providing the cow with everything she requires is greatly improved by having variety in the diet. Some plants have much greater capacity to accumulate minor elements from the soil than others. One of the important reasons for having legumes in the mixture lies in their

generally high content of cobalt. Bluegrass also is high in cobalt. Timothy and orchard grass are usually very low in this element.

A number of cases of X-disease of cattle have developed on farms that have been very liberally limed and phosphated. These practices reduce the availability of most of the minor elements, notably of zinc. The zinc content of bluegrass and ladino clover from X-disease farms in New Jersey was found to range between 15 and 25 parts per million dry matter, in comparison with 34 to 92 parts per million in the same forage crops on nearby farms where no X-disease occurred. The evidence on this point, however, needs more confirmation.

Something should be said about manure. Our well-fed 1,300-pound Holsteins produce manure at the rate of 21 tons annually per cow, not including the bedding. Of this, 75 per cent is feces and 25 per cent urine. This manure contains about 9½ pounds nitrogen, 3 pounds phosphoric acid (P_2O_5), and 8 pounds potash (K_2O) per ton. The annual output of fertilizer constituents in the manure of such a cow is estimated to be equivalent to one ton of 10-3-8 fertilizer. It would seem that such an amount of plant nutrients, no matter whether they were dropped directly on the soil by the cow or were hauled out from the barn, should go a long way toward maintaining the fertility of the land required to produce enough feed for that cow.

In theory, there should be little need for anything but lime and superphosphate to supplement the manure on a dairy farm, assuming that legumes were grown in the hay and pasture mixtures. In proportion as grain feeds are purchased and fed, the picture looks better still. But we have found that fertility levels on the pasture soils of many dairy farms are very low. Evidently much of the value of the manure contributed by cows is lost in drainage water. It would pay dairy farmers to explore means by which such losses can be lowered. Ammonia losses can be kept down by adding superphosphate to the manure as it is applied. If the urine is collected separately from the dung, air-tight containers with oil seals are required to prevent escape of ammonia.

It would not be becoming to a believer in soil conservation to omit mention of the healing properties of grass on eroded soil. The roots of the grasses sew the soil to the earth. In proportion as more grass is grown on more acres of land, the best interests of the Nation are served. That applies today, but it applies much more to tomorrow.

Cutting Production Costs

Condensed from Hoard's Dairyman

K. T. Wright

How much does it cost to produce 100 pounds of milk? According to a study of the Detroit milkshed, there are some dairymen who can produce milk at a cost of $4.00 per hundred below the cost of production of other dairy farmers.

During the period of our investigation, 1945 through 1949, the cost of producing 100 pounds of milk of 3.7 per cent test averaged $4.13. In each of the five years the investigations were carried on there were dairymen whose costs were about 80 per cent above the average of the whole group, while at the other end of the list there would be a man whose costs were 30 per cent below that average.

Why should some dairymen be able to produce milk so much cheaper than others? We believe the results of our study may provide some of those answers.

The farms of the men in this study averaged about 180 acres, with about 140 tillable. Forty-five per cent of the tillable land was in hay and pasture, 30 per cent in small grains, 17 per cent in corn, and most of the balance in cash crops.

The herds averaged about 17 cows and these cows averaged about 8,200 lbs. milk testing 3.7 per cent fat. Two-thirds of the total income on the farm was accounted for by the sale of milk and dairy cattle.

The labor supply for operating these farms, including the dairyman, his family, and hired help, amounted to an equivalent of 1.7 men per farm. The investment, wrapped up in dairy cows, young stock, bull, dairy barn and equipment, in 1949 was $730 per cow. Detailed figures on the total farm investment are not available but it is estimated that the strictly dairy investment was a little over one-third of the total farm investment.

Over a five-year period the cost of keeping a cow in these herds was $339 annually. This cost included feed at market prices, labor at what the farmer said his own time was worth, plus actual costs of that hired, and all other items such as depreciation on cows, interest on investment, use of buildings, and all other costs.

Reprinted by permission from Hoard's Dairyman,
Fort Atkinson, Wisconsin, October 25, 1951

Feed was the most important single item of cost and as an average for the entire period, made up 48 per cent of the total cost. The time of the dairyman, his family and hired help, was charged against the cows at an average rate of 88¢ an hour for the period of this study. At that rate, the charge for labor made up 30 per cent of the total cost of keeping the cows.

The time spent by cooperating dairymen annually in taking care of a cow declined from 132 hours in 1945 to 93 hours in 1949. In other words, a reduction of over 20 per cent. A number of factors were responsible for this, among which are the following:

(1) A marked increase in the use by farmers of labor saving methods;

(2) The high wages of farm labor;

(3) Shortage of labor;

(4) Improvement in the arrangement of barns and use of pen barns;

(5) Development of labor saving equipment and possession of sufficient money to buy the equipment.

Another thing that should be mentioned as a possible cause of reduction in hours labor was that the share of the dairy chores done by the dairyman himself increased from 68 per cent in 1945 to 85 per cent in 1949.

It has just been pointed out that feed and labor made up 78 per cent of the total cost of keeping the cows and producing milk. Obviously it is these two items that warrant the bulk of the attention of anyone wishing to reduce milk production costs.

The remaining 22 per cent of the costs were largely small items, none of which exceed 5 per cent of the total and most of them only being two or three per cent.

The income from milk sold and used, and credit for the calves produced as well as the manure, averaged $356 per cow for the five years. This amounted to $4.34 per cwt. of milk. The net return on these better than average herds (average fat production of 307 lbs. per cow) was $17 a cow. This may not seem very high, but if one combines this net return with the charge that had been made for labor, there was a return of $121 for the 118 hours of labor spent per cow, or a return of slightly over a $1.00 an hour for all the time spent in the care of the milking herd. Slightly less than eight-tenths of this was performed by the dairyman himself, while the balance was done by family labor or hired help.

The records on the herds were arranged on the basis of the cost of a hundredweight of fat-corrected milk from the highest cost to the lowest cost producer to study the causes and results of these variations. The high-cost

one-fifth were averaged and compared with the low-cost fifth. There was a difference between the two groups of over $2.00 a cwt. in the cost of milk production as an average for the five years. The dairymen in the high-cost group lacked an average of $72 a cow of making expenses, while those in the low-cost fifth netted $88 per cow, or a difference of $160 in the net return annually from each cow in the herd. On herds of the average size of those in this study (17 cows) this meant a difference of about $2,500 in the net return per herd in the year.

Another way of looking at it is to consider the return per hour labor.

The dairymen in the low-cost group made themselves a net return of over $1.50 an hour more than the dairymen in the high-cost fifth.

Hourly returns on individual herds, of course, showed even greater variation. Evidently good management of the dairy herd makes a tremendous difference in the profit realized by the dairyman.

The next question is, what did the low-cost men do that made it possible for them to produce milk cheaper and make higher returns. The principal causes studied were:

(1) Total annual milk production of the herd;
(2) Size of the herd;
(3) Milk production per cow;
(4) Seasonality of milk production;
(5) Feeding efficiency;
(6) Labor efficiency;
(7) Herd replacement costs.

Annual milk production of the herds in this study ranged from about 50,000 to nearly 400,000 lbs. A group of the low-volume milk herds averaged about 75,000 lbs. milk a year from about 11 cows. The high-volume herds produced about 300,000 lbs. milk from an average of 35 cows.

The men with the high-volume herds spent a third less time to produce 100 lbs. milk than those with the low volume. In view of the current labor costs, this difference in efficiency deserves special consideration. The cost of producing milk on high-volume herds was about 50 cents a hundredweight less than on the low-volume herds. The returns for all the labor spent in the care of the cows averaged $1.27 an hour on the high-volume herds compared with 76¢ on the low.

Or, to look at it from the standpoint of the entire cow-herd and the total time spent in their care, we find that the total labor and management return on the high-volume herds was approximately $4,500 compared with about $1,000 on the low.

Size of the herd was mentioned as a factor affecting costs. Ob-

viously the size of the herd is involved in obtaining a higher total milk production, as has just been described. The large herds in this study had a slightly higher average production of milk per cow in the year than the small herds. The hours of labor spent per cow on the herds averaging about 35 cows was almost a third less than those averaging ten cows.

Generally speaking, a herd of at least 20 cows seems to be necessary for efficient production.

High milk production per cow is one of major importance in obtaining efficient milk production. During this study the herds averaging about 6,200 lbs. of 4 per cent fat-corrected milk per cow had an average cost of $4.90 per cwt., compared with $4.00 on those herds averaging about 9,700 lbs. milk per cow. This reduction in costs was most rapid as herds were moved up from the lower production levels and least rapid at the higher levels. For instance, the first 1,000 pounds increase in the average milk production per cow from 6,200 pounds lowered the cost 43¢ a hundredweight, the next 1,000 pounds 28¢ a hundredweight, and the next 1,000 pounds about 17¢ a hundredweight.

The return to the dairyman for his labor and management on the cows averaging about 6,200 lbs. production was about $80 compared with $150 for those of about 9,700 lbs. production. Incidentally, it might be added that the influence of higher producing cows on costs and returns were greater when prices were high. High producing cows are essential for efficient production and satisfactory net returns. Apparently the major factors back of the higher average production were:

(1) Greater inherited productive capacity of the cows;

(2) Better quality and kind of feeds;

(3) More fall freshening cows;

(4) A shorter average dry period;

(5) Generally better care and management by the dairyman.

Some consideration was given to seasonality of milk production. In one year of the study, a comparison was made of the herds with relatively heavy spring and summer production with those with comparatively even production. Dairymen who produced more in the fall and were able to obtain a more even seasonal production pattern, had a higher average production per cow of about 1,000 pounds. Their cost of producing milk, as an annual average, was about 30¢ a hundredweight less than the high-spring producers and they also got a bit higher price for the milk. Thus, their net returns per cow were about $35 higher.

Feed made up almost half of the total cost of keeping cows; thus, the farmer's feeding effi-

ciency is of utmost importance in obtaining low costs. Here again we find much difference between individual herds. A comparison of the fifth with higher feed cost per cwt. of milk with the low-cost fifth showed a difference of over $1.00 a cwt. in the feed cost alone.

The low-feed cost dairymen had higher producing cows by over 1,000 lbs. and they fed almost a third less grain and roughages to produce 100 lbs. milk.

Letters were sent to the efficient feeders asking them what, in their opinion, was the explanation of low feed cost. The most common points mentioned by these men were: the use of alfalfa-brome for hay; alfalfa-brome pasture; pasture improvement and use of supplemental pastures to lengthen the season; feeding the cows in proportion to their milk production; and up-breeding of the herd through the use of better bulls and careful culling.

The amount of grain fed the milk cows made a big difference in the feed cost. The grain fed to the milking and dry cows by the dairymen in this study averaged about 1 pound for each 3 pounds of milk produced.

A study of the rate of grain feeding showed that dairymen who had herds averaging about 250 lbs. fat per cow reduced their net returns when they fed beyond one pound of grain to five pounds of milk. Those who had herds averaging about 300 lbs. fat per cow could go to one pound of grain to four of milk before they reduced the net returns, and then the reduction was not as rapid as with the low producers. While those who had herds producing at least 350 lbs. fat increased their net return by feeding up to one to four. Feeding beyond that level reduced their net return more slowly than with lower producing cows.

Labor hours per cow in a year on individual herds in this study generally ranged from 70 to over 200. In other words, from about 10 to 30 minutes per cow per day. Dairymen can increase their labor efficiency either by keeping more cows and producing more milk with the same labor, or by reducing the amount of time spent in the care of a herd of the same size. The first method has already been discussed.

Many farmers have accomplished remarkable savings in the time needed to take care of the cows by giving careful thought to a rearrangement of the barn and dairy buildings for greatest convenience, perhaps changing to a pen type barn; making more effective use of labor saving dairy equipment; and making a careful study and analysis of their work methods which frequently mean the practicing of "managed milking," elimination of unnecessary operations, and combination of

jobs.

The dairymen in this study spent 1.4 hours to produce 100 lbs. milk as an average for the five years. Many dairymen spent less than one hour for each 100 lbs. milk, while many others spent over two hours.

If one values his labor at $1.00 an hour, this makes over $1.00 per hundreweight difference in the cost of milk production.

About 30 per cent of the cows in the herd were replaced each year in the herds in this study. Three-fourths of the replacements were home-grown heifers and one-fourth purchased cows. The annual cost of raising a heifer was $105, and since the heifers freshened at an average age of 2.3 years, the freshened heifers cost about $240. The average value placed on these heifers by the dairymen who had received instructions to value them at what they would have to pay for a comparable heifer, was $182.

This does not mean that no heifers should be raised for replacements, but it does indicate that careful thought should be given to less expensive methods of raising the heifers which would not reduce their size or development. Then, too, replacement costs might be reduced by more careful selection of the heifers kept.

In brief, the following points need particular attention for satisfactory earnings on selected dairy farms:

(1) A farm sufficiently large and fertile to make possible the efficient production of enough feed to support a sizeable dairy enterprise;

(2) A cropping program aimed at maximum long time feed production, which generally means legume hays and pastures or adapted grasses adequately fertilized;

(3) A balance in the crop and livestock organization and the farm investment so as to make most efficient use of the farm resources;

(4) A large volume of milk production for full and efficient use of labor, buildings, and feed which requires a good sized herd and good production per cow;

(5) A fairly high proportion of fall freshening cows;

(6) A feeding program based on high quality legume hays harvested to preserve the maximum nutrients, productive pastures throughout the season, plus home grown grains and needed supplements at the rate of not over one pound to four pounds of milk;

(7) Arrangement of the buildings to save time and steps, full use of labor saving equipment, and careful consideration of the chore routine to promote high labor efficiency;

(8) Care and management of the herd so that not over one-

fourth or one-fifth of the herd have to be replaced each year;

(9) Reduction of heifer costs through raising only the best heifers and making full use of the roughage in the second year.

Insurance Before You Need It

Condensed from Eastern States Cooperator

E. M. Whitaker
Federal Land Bank of Springfield, Massachusetts

EXPERIENCE teaches that every farmer should know the details of his insurance policies and keep his agent up to date on all farm changes. All too often, farmers fail to inform their agents of circumstances which might affect the legality of their insurance. A good agent, one who knows his business thoroughly and takes a personal interest in his assureds, is a contact worth cultivation by every farm owner.

Thousands of farm buildings are inadequately insured today because of inflated replacement costs. Values have increased over 60 per cent in the past 10 years in many states and any farmer who has not increased his insurance during this period is underinsured. Whatever a farmer's reason might be for not having added more coverage, the pennies saved thereby wouldn't repair or replace much, should a loss occur.

Total fire losses throughout the country have increased to staggering sums, with farm losses averaging approximately $100,000,000 yearly. It is estimated that in the past five years one farm family in every 10 suffered a fire loss.

Nearly all farms have fire hazards which demand the attention of every member of the family. Statistics prove that about 90 per cent of all fires are preventable. Fire protection is enhanced if water is available—from an easily reached water hole, reservoir or cistern. Keep garden hose and light ladders with roof hooks handy. And, the farm house-wife should have a plan for getting her family out in case of fire at night. Fire prevention pays dividends!

Commendable, indeed, is the recognition given New England farmers by many fire insurance companies who now rate each farm individually, so that the farmer with superior improvements receives a premium reduction over one not so free of haz-

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ards. It will save you dollars to have standard chimneys, noncombustible roofs, approved fire extinguishers and lightning rods. When erecting a new building, place it at least 30 to 50 feet away from other buildings for insurance credits. Also, rate reduction is allowed if the farm is on a hardened road in a town with an approved fire department and available hydrants.

In most states, if your dwelling is to be vacant or unoccupied beyond 60 days, notify your agent and obtain a "Vacancy Permit" to attach to each fire insurance policy. Failing to do this, your coverage may be suspended thereafter if such condition continues.

Incomplete title in a policy may reduce a settlement. Only those interests listed are insured. If you are the sole and unconditional owner of the property being insured, only your name need appear on your policy; but if according to the deed, title is vested, for instance, in yourself and your wife or yourself and your brother, then it is necessary for both names to appear in the policy to provide full protection.

The "Livestock Pro-rata Clause" is often misunderstood. In order to secure total reimbursement for loss of cattle 100 per cent of value should be carried. If your herd of 50 cows is valued at $15,000 ($300 each) and is insured for only $7500, you are insuring only one-half of each head. Should one cow be destroyed in a fire or by lightning, you would collect only $150. If you do not want the pro-rata clause used, the cost of such insurance will be double as to rate. This same principle or "Pro-rata Distribution Clause" applies to insurance on tools, machinery and equipment.

A windstorm may destroy an important building just as completely as a fire, leaving a farmer in a serious situation if he has no insurance coverage. Losses caused by such storms are becoming common. Buildings can be damaged by explosion, hail, riot, aircraft, smoke and vehicles. The ordinary fire insurance policy makes no provision for recoveries under losses of this character. However, an "Extended Coverage Endorsement" may be purchased from most companies and attached to their farm fire insurance policies to afford protection against these hazards to the same extent as the coverage against loss by fire. Some states require a $50 deductible in such clauses. Should you have more than one policy insuring the same building or buildings, remember that if the "Extended Coverage Endorsement" is attached to one, it must be attached to the others if full recovery to the extent of fire insurance written is expected.

Farmers should give careful consideration to other types of

insurance protection which may be necessary because of their operations. Workmen's compensation insurance and personal liability policies afford relief to the farm owner. Insurance on motor vehicles operated by the farmer off his premises is of great importance, since bodily injury and property damage claims due to automobile accidents run high. If your trucks are on the highways often, consider well your position should an accident claim be enforced against you.

Farmers must today give more serious thought to requirements of their policies in order to maintain full, collectible coverages. Also, farmers should carefully review their needs for insurance protection and make sure such insurance in amounts sufficient to meet their requirements is purchased.

What are some of the insurance needs of an average farmer? While the word "average" is subject to discussion, certainly every farm owner needs sufficient fire insurance coverage on his important buildings, which should carry the "Extended Coverage Endorsement" and the same requirement applies to his household goods and building contents, including livestock, machinery and equipment.

Greenhouses need special consideration involving both wind and glass. Tobacco growers customarily purchase hail insurance while others purchase crop insurance. Like the city dweller, farmers are subject to suits by outsiders claiming injury due to some defect occurring on his property for which comprehensive public liability affords protection. This could include damages caused others by spraying, as well as damages claimed by someone purchasing your products. To the extent a farm owner hires labor, workmen's compensation may be not only desirable but might be compulsory.

With today's high record of motor accidents and large jury awards, every farmer operating motorized equipment on the highways needs bodily injury and property damage insurance. While the minimum of such insurance is $5/10,000 BI, higher limits are most advisable, especially since such increases are moderate in cost. Never pull a trailer over the highways attached to your automobile unless your insurance policy is endorsed with such permission.

Special types of farming involve special kinds of risks which should be carefully discussed with your agent. Use of warehouses for storage, shipping of produce, use and occupancy, exhibitions, theft and robbery, all enter the picture in many farm operations of today and create their own problems for insurance protection.

Life insurance, health, accident

and hospitalization for members of the family, especially the breadwinner, need the consideration of every family head, be he a business executive or a farmer.

There is a limitation as to a farmer's capacity to purchase all the types of insurance he may desire and this is a subject needing his most careful consideration and discussion, not only with his agent but also with his family. So-called packaged insurance is now appearing on the market, some available to farmers, which gives comprehensive coverages including several types of essential needs at less cost than single policies.

Problems of farm insurance are today more complex than in the days of our pioneers and just to that extent must greater consideration be given to this subject by farmers in order to preserve and protect a prosperous future.

He Gets a Monthly Hog Check

Condensed from Successful Farming

Delmer E. Groves and Vernon Schneider

How would you like to have the regularity of a dairyman's income—*from hogs?* J. Herbert Doak, Wilmington, Clinton County, Ohio has just that. He's selling top market hogs every month of the year. And he's getting the job done with less labor and equipment than most 1- or 2-litter-a-year hog raisers use.

Any month of the year you visit the Doak farm, you'll find at least five sizes of pigs. They range all the way from baby pigs to market hogs. Here are five basic reasons why Doak likes this system of raising hogs: (1) It spreads the labor more evenly over a 12-month period; (2) any ideas or improvements can be put into practice immediately; (3) in case of loss, you have a chance to regain it in 30 or 40 days, rather than the usual 4 or 5 months; (4) equipment is in use 90 percent of the time instead of the usual 40 to 50 percent; (5) best results are usually with hogs in groups of 100 or less.

Let's take a closer look at some of the management practices which make Doak's system tick:

A unique multiple-farrowing system enables Doak to farrow 8 to 12 sows every 3 weeks. The number of sows which he farrows over a 12-month period depends on the amount of corn on hand

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December 1. Doak breeds 1 sow for each 100 bushels of cribbed corn. In this way, the number of hogs he markets each year is regulated by the corn he produces.

His plan is based on a dozen individual farrowing houses placed along the back edge of a solid strip of concrete. Individual exercise pens are attached to the fronts of the houses. The entire strip is covered with macadam. It's cooler than bare concrete in the summer and warmer in the winter. And there's less danger of its getting wet and slick during wet weather.

The floor under each box (farrowing house) slopes down to the guardrail. This slope causes the sow to lie down with her udder facing the guardrail. Baby pigs can then suckle with less danger of being lain on. The pens also provide for electric brooders.

The pigs' eyeteeth are clipped when they are 1 day old. An iron tablet is also crushed in each pig's mouth at the same time. The male pigs are castrated at 2 weeks of age.

A door back of the guardrail allows Doak to handle the pigs without danger to himself. The door also provides cross ventilation when the ventilators along the roof in the front of the houses are open.

The boxes are 7 feet square, 6 feet high at the front, and 4 feet at the rear. Insulated aluminum roofs help keep the heat down during the summer. The entire 12-box unit takes up an $18' \times 90'$ space. Each pen has a self-feeder and a concrete drinking trough. Water is piped to the unit and the feeders are filled directly from a truck.

The 12 boxes are lined up on the north side of the concrete slab. They are not fastened down, so they can be scooted off the slab and upturned for cleaning and disinfecting between farrowing.

Two weeks after farrowing, the sows and litters are moved to pasture. Both are hauled to the pasture in a large box built on runners. Doak has found that if you drive the pigs between pastures, they aren't likely to stay penned up. By hauling them, he has litle trouble keeping them in the pasture.

No runt pigs are kept. They are destroyed before the litter leaves the farrowing house. Doak has found that most runt pigs show up during the first 2 weeks after they are farrowed.

The only shelter summer or winter, the hogs get from the time they leave the farrowing house until they are placed in the fattening pen is furnished by 8 double boxes. During the summer, these boxes (2 to each pasture) are paired facing each other and bridged across with poles and old lumber to furnish shade. During the winter, 2 double boxes are placed together (1 facing east, the

other south) near a dense woods. A self-feeder and a winter water fountain are placed conveniently in front of the 2 houses. Corncobs and a little straw are used for bedding the year round to help eliminate dust.

Doak uses a series of Ladino pastures for the pigs, each batch getting a fresh pasture. A creep feeder is placed in the pasture when the pigs are 3 weeks old. Water is piped to an automatic fountain in each pasture. The pigs are vaccinated at 6 weeks of age, weaned at 9 weeks, and wormed at 10 weeks.

When a group of pigs reaches 140 to 150 pounds (110 pounds in the winter), they are brought into the feeding barn where they are kept until they reach market weight. Here they are placed on a ration of ground corn, tankage, and soybean meal. Doak first prepares a premix of 100 pounds of tankage and 200 pounds of soybean meal. This is mixed with ground corn—1 part premix to 10 parts of corn. Hogs on dry lot also get a special supplement containing B vitamins and antibiotic supplements. Lights are kept on all night in the feeding barn. A mineral mix is kept before the hogs at all times.

Crushed corncobs from a local mill are used to bed the fattening hogs. The pens are cleaned once a week with a tractor scoop. More than 100 hogs can be handled on the 2 feeding floors which intersect at the center. All four doors can be opened, giving double cross ventilation.

A 20′ × 70′ concrete apron on the lower side of the barn gives the hogs a sun porch. Another section of the barn is used for preparation and storage.

When 20 to 30 hogs reach market weight, they are run over an old mill scale built into the barn. Any hog which doesn't weigh enough to meet market needs is run back into the fattening pen. The top weight varies from 200 to 240 pounds. By keeping abreast with the market demands, Doak knows just the right weight to market his hogs at premium prices. Right now it's running about 240 pounds.

The scales are also used for keeping weight records throughout the growing and fattening period. All the pigs are weighed at weaning time. When they are brought into the fattening barn, 5 percent of each group is marked and weighed weekly to determine the rate of gain. Doak uses a three-way crossbreeding program, and this gives him a chance to find out which cross is giving the most efficient gains.

Doak doesn't consider any month of the year as an off-season market. "It's not what you get for the hogs," says Doak. "It's what you have in them in the way of costs." Doak keeps close records

on each batch of hogs, and the spread on hogs going to market at a high price has been about the same as those selling at a lower price. He has found that the off-season hogs usually carry more costs.

As for disease, Doak is fighting it all the time, but does not consider his farm a problem farm. His sanitary measures are the same as those of any other good hog raiser. Doak considers nutrition the biggest factor in keeping hogs healthy. Here are his pointers on nutrition: (1) Don't change the ration on a group of pigs after they are started; (2) full-feed the sows right through farrowing; (3) even up the litters; (4) buy your feed and mineral from a local dealer whom you can trust; and (5) feed irradiated yeast the year round.

"In these days of high costs and low margins, no farmer can afford to invest in expensive equipment and then use it only a few months out of the year," reasons Doak. His system not only makes maximum use of time and equipment, but squeezes costs all along the line.

A New Pasture Every Morning?

Condensed from Farm Journal

Claude W. Gifford and Ralph D. Wennblom

LET'S assume that we're running a farm and want to make as much money as we can with grass. Our State Experiment Station can tell us which legumes and grasses grow best in our part of the country. What we want to know is *how to manage grass so that it will make the most feed.*

That was the question we put up to R. E. Hodgson, Bureau of Dairy Industry, USDA; W. E. Petersen, University of Minnesota; and D. W. Colvard, North Carolina State College. Here are our questions and their answers:

What about dairy cows? How much milk can they produce on roughage alone?

HODGSON: Good cows can make from 8,000 to 12,000 pounds of milk a year just from roughage. The average cow in this country produces only about 5,000 pounds. Actually, if we fed enough high-quality roughage, we could produce as much milk as we do now —and do it without feeding a bushel of grain.

PETERSEN: I've seen a cow that has produced 932 pounds of

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butterfat on nothing but grass and hay. And she was milked only 286 days, twice a day. The next year she came right back under the same conditions and made 938 pounds of butterfat. Cows can handle some kinds of fiber but not others. They digest *celluloses* very well, but not *lignin*. Young plants are made up mostly of cellulose, but these change to lignin as the plants become mature. The stage of growth of the roughage, then, has a lot to do with how much milk you get from it.

How are you going to see that a cow gets as much young grass as possible ?

PETERSEN: We've got to go to rotational grazing. In New Zealand, the standard practice is to put cows on a fresh pasture each morning. It takes at least 20 cows to graze down an acre of 6-inch-high grass. They will get all they want of this young growth, then move on to a new plot the next day.

The New Zealanders divide their pastures into as many as 18 sections. During the fast-growing season they may rotate only 9 or 10 plots, and cut the rest for grass silage or hay. When the grass starts to slow down, they pasture more of the plots—this gives the grass on each section more time to recuperate. During dry spells, they feed silage and hay along with the pasture.

COLVARD: We've just completed in North Carolina an experiment which showed that clippings from young orchard grass in a ladino mixture run 20% to 21% of usable proteins. The same grass in bloom has only 5% to 6% digestible proteins.

PETERSEN: We tried the New Zealand rotational system on rye pasture at the University of Minnesota. The cows cut out their hay and silage; and more than half of them wouldn't touch grain at all. Milk production went up at the same time.

How much more milk and meat do you get from rotational grazing?

HODGSON: It varies with the type of pasture; we got about a 10% increase in milk with rotational grazing in two experiments on permanent bluegrass pasture at Beltsville.

PETERSEN: I saw one experiment in New Zealand with identical twin cows. The cow on rotation pastures produced 59 pounds more fat per year.

We all know that it costs more to rotate pastures. You have extra fencing to do; it takes more work to shift cows from one pasture to another; and you might have to put water into pastures that don't have it. Will the advantages of rotational grazing pay for these extra costs?

PETERSEN: Yes, I think so. The extra costs don't have to be high. With electric fences, some

very light wire and sticks are all that's needed. And you can run your fences out from your water like spokes in a wheel.

HODGSON: Not only do you usually get more milk from rotational grazing, but it's easier to set aside part of the pasture for hay and silage; easier to fertilize, easier to irrigate, and easier to mow. Your pasture mixtures last longer. Your cows also graze more evenly, and don't travel so far in a day.

Let's say that you have an improved pasture, and that you're going to set it up for rotational grazing. How do you go about it?

PETERSEN: I'd say you could make a start by rotating three plots in the spring. Make your plots of a size that will take care of your cows for about 10 days. Then as the summer comes along, start grazing a fourth plot from which you took hay or silage earlier.

That way, you don't change the size of the plots as the growth slows down—you increase the number. You come back to each one less frequently—say, every 20 days when you have three plots, and every 30 days when you have four plots.

Always put your cattle on a new plot when the grass is right—when the plants are still young, but have had time to recover from the last grazing.

COLVARD: Calves and heifers should graze on something more mature than extremely high-moisture plants. Sometimes, they can't get enough feed from that kind of grazing.

It's not a bad idea to let your milking cows go over a pasture, and then bring the heifers and dry stock in to clean up the coarser growth after the cows have moved on.

How much grass does a farmer need?

COLVARD: You'll want to plant enough so livestock will have good grazing during the entire pasture season, and so you'll also have hay and silage when the pastures aren't growing.

PETERSEN: Yes, and remember this: you'll need to graze more acres in August than you did in June. A cow needs about the same amount of roughage each day, but pastures grow faster at some times than others. The size of your grazing area must expand and contract with the rate of growth of the plants.

HODGSON: No one grass crop will give you enough grazing for the whole season. For instance, you need special pastures to take over in the summer heat. Or, you may make hay or grass silage from surplus spring pasture and feed it during the dry spells.

COLVARD: It boils down to this: use different kinds of pasture, along with hay and grass silage, in a *program*, and aim for the greatest amount of feed over

the entire year.

You can't, then, simply seed grass and watch it grow.

COLVARD: Not if you want to make the most money. Grass is like any other crop. You manage it and harvest it at the best time—just like wheat, corn, cotton, or tobacco.

And you certainly need enough animals and harvesting machinery, of the right kind, to get the most out of grass.

Doesn't that make grass pretty expensive?

HODGSON: Well, you have to compare it with what it costs you to get feed from other crops. The feed value that the average farmer gets from an acre of barley or oats is far below what he gets from an acre of legumes, or even from a not-too-good pasture. Corn silage is our heaviest yielder of feed per acre, and livestock farmers should certainly use it. Much of the land that is in small grains—especially steeper land—would make more money if it were in grass.

PETERSEN: Just last year we got the equivalent of 85 bushels of corn to the acre from our pasture plots. You see, grass grows for five or six months in Minnesota, while corn grows for only three months.

Can a farmer afford to put grass on land that grows good crops of corn, cotton, or wheat?

COLVARD: Not always, but most farmers can't keep the whole place in cultivated crops. Grass and livestock are usually the next best money-makers. And the farmer who has livestock will make more money by growing his roughage first, and then buying his concentrates if he has to.

PETERSEN: I don't believe any of us will advise that a man turn his entire farm into grass. But most farmers can do two things, and make more money by doing them:

(1) Try to get more roughage from the land that *is* used for grass.

(2) Grow high-producing lĕgumes and grasses on crop land every few years to boost the yields of the cultivated crops.

Can you really make money on grass without making part of it into grass silage or hay?

COLVARD: If you set up a grazing program that gives you summer-long grazing, you're going to have an excess of growth in the early season. It doesn't do any good to produce grass unless you harvest it, and silage or hay is the only way you can handle this surplus.

PETERSEN: Under-grazing yields poorer returns than over-grazing. You actually get less pounds of milk per acre by under-grazing than you do by over-grazing.

With under-grazing, the plant becomes too mature, and the valuable celluloses turn into unusable

lignin.

How can you keep silage from spoiling?

COLVARD: Have a good silo. Put up the grass when it has wilted down to about 60% to 68% moisture—at that moisture content, you don't need a preservative. But if you aren't sure of the moisture, you can add a preservative such as molasses, sulphur dioxide, or ground corn.

HODGSON: Also cut the forage fine, and pack it hard. With the moisture content at 60% to 68%, you haul in less water from the field; the silage usually doesn't have as strong an odor; and I believe the cows will get more dry matter from this kind of silage.

You hear that you get about two-thirds of your pasture growth during the first half of the growing season. Is that true when you plant seasonal grasses?

HODGSON: Not so true as with permanent pasture. Our renovated, improved pastures at Beltsville—where we tore up the sod and seeded taller-growing grasses and legumes—are producing twice as much feed in July and August as our permanent bluegrass pasture does. The difference is mainly due to the deeper-rooted legumes that grow better during hot weather.

Renovate your permanent bluegrass—it pays. We think it's the easiest way to make more money from grass. Not only will you get more feed (we get more than one-third more at Beltsville), but you'll get the increase during the mid-summer months when you need it most.

You have mentioned New Zealand several times, Dr. Petersen. Do they actually know how to use grass better than we do; or do they just have an advantage over us in climate?

PETERSEN: They have the edge on us both ways—but their most important advantage is in using grass better than we do. They feed *very little* grain to their dairy cattle. All of their beef and their lamb is made from grass, hay, and silage.

They do have a long growing season, and the rain is distributed well, but listen to this: in one of their valleys where they produce more milk and butterfat per acre than any other place in the world, they get a third of their year's pasture growth in two months' time. They make hay or silage out of that surplus and use it as the growth slows down.

There is one dairyman in this valley who milks 243 cows on 240 acres, and not one ounce of feed is bought from outside. And this land was abandoned grain land in 1920.

The New Zealanders have been doing outstanding things with grass while we have been doing outstanding things with grain.

Our farmers could make more money by shifting some of their attention to the better ways of using grass.

How Does Your Corn Grow?

Condensed from The Rural New-Yorker

Dr. D. F. Jones

In most of the corn growing regions, the past season was one of the coolest on record. Parts of Pennsylvania and the Middle Atlantic States were dry, while northern Iowa, part of Illinois and Minnesota were too wet. In New England and New York rainfall was below normal but came during July and August when most needed. In the wetter areas leaf blight and rust reduced yields. Frosts held off fairly well, but there was some soft corn in the northern regions. On the whole, however, 1951 yields were good.

These excellent yields were the result not only of improved hybrid seed but also of better farming practices, especially more adequate fertilization of the soil and increased weed control. The beneficial effects of abundant nitrogen fertilization were more apparent this year than ever before, especially on the heavier, poorly drained soils. In our test fields the plants in one were yellow, spindly, with poor ear development and late maturity; while in the other the plants were dark green and sturdy, with well filled ears that were well matured. The difference was due largely to a better nitrogen supply.

The yellowing and dying of the lower leaves at the tips and along the midribs in a V shape, formerly often attributed to a lack of moisture, is now known to be due mostly to nitrogen deficiency. Wet, poorly drained soils are cold in the early part of the growing season. There is little bacterial action in these soils and the nitrogen contained in organic matter such as green manure, stable manure and composts, is not released in an available form for the plants to use. In light, sandy soils the soluble nitrogen salts are leached out during heavy rainfall so that all kinds of soils are apt to be deficient in nitrogen in cool, rainy seasons.

The use of a fertilizer, with part of the nitrogen in a quickly available form at planting time, gets the plants off to a good start

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333 W. 30th St., New York City, New York, January 19, 1952

but, for best results, additional applications, when the plants are about two feet high, are usually well repaid. This was especially so in the past season. Though ammonium nitrate is one of the cheapest and most concentrated forms of nitrogen available, this fertilizing ingredient is so soluble that much of it is lost by leaching before the plants can use it. For this reason the practice of later applications during the growing season is coming into general use.

Here in the Northeast it is necessary to use a complete fertilizer either in the form of manure supplemented with phosphate, or a mixed general formula the composition of which is adjusted to the needs of the soil as shown by a soil test and by the growth and appearance of the plants. The plant itself is one of the best indicators of its plant food requirements. The right formula to use varies with the previous treatment of the soil and the crops grown. From 1,000 to 1,500 pounds of a 1-2-1, or a 1-3-2 ratio fertilizer, is the usual recommendation. But in soils that are deficient in potash, or have accumulated excess phosphorus, the ratio can be changed to a 1-1-1 or 1-2-2.

When manure and phosphate are used, it is worthwhile to apply from 200 to 300 pounds per acre of mixed fertilizer at the time of planting to give the seedlings a good start. Additional nitrogen at the second or third cultivation is usually beneficial, especially in cool, rainy seasons.

It is poor practice to put expensive fertilizer ingredients on soils where they will not be used, and even more unwise not to apply them where needed. The labor for soil preparation, planting and cultivating is about the same for a poor crop as for a good one. The crop itself can tell you what it needs after it is grown, but only a reliable soil test can tell what to use at planting time. Your county agent can help you with this problem.

Organic matter is essential to maintain good physical condition of the soil and to supply the minor elements. Rotation with pasture and meadow plants, and with other cultivated crops, is needed to maintain organic matter. Where the cornstalks are removed, as for ensilage or stover, it is important to return an equivalent amount of organic matter in the form of manure. A 100-bushel corn crop has about two and a half tons of dry matter in the stalks and cobs and about a half ton in the roots. This is equal to about 10 tons of manure.

One of the definite advantages of hybrid corn is its ability to respond and use high rates of fertilizer applications. This comes from its sturdier growth, better root systems and stalks, and leaves that are resistant to the rot, blight and

rust organisms that have caused more damage in the past than was realized. Hybrid corn now stands up until harvest with less root lodging and stalk and ear breakage due to corn borer infestation. Even in severe storms when many varieties go down, the better varieties hold together because they are sufficiently well anchored in the soil by their strong roots. Such plants can be picked up and harvested by machine, either the corn binder, field chopper or husking machines.

New hybrid varieties are being produced each year, representing improvements in some respects and these will be added to the list of dependable varieties for each locality. Thorough testing over a period of years is needed to establish the value of any corn variety. When a good one is found, one should be slow to replace it with an untried variety no matter how well it has performed in trials elsewhere. Your local county agent and State experiment station have lists of varieties that have produced well in each general area.

Plantings made between May 15 and June 1 usually yield best. Every day that planting is delayed after June 1 usually results in a decrease of several bushels per acre. Plantings made before May 15 may give poor stands and yield falls off rapidly as the number of plants per acre is decreased.

The rate of planting should be adjusted to the fertility and moisture holding capacity of the soil. The largest yields are usually obtained when the average weight of ears is a half pound. This is a much smaller ear than most farmers like to see. Prize winning ears at the corn shows usually weigh one pound or more, but their yields per acre are seldom mentioned.

The usual planting rate is from 10,000 to 12,000 seeds per acre. The actual number of plants growing in such a field is from 8,000 to 10,000, often many less than this due to poor germination, bird and insect damage. An increase in the actual number of plants per acre to 15,000 to 18,000 may increase yields of both grain and fodder from 25 to 50 per cent. These increases are only obtained on well drained soils with abundant organic matter and adequate fertilization, and only with varieties that can respond to thick planting. Many varieties cannot do this. The stalks become weak from stalk rot and many plants go down.

The use of chemicals to control weeds in corn is now becoming standard practice. The best time to apply 2,4-D is when the seedlings are breaking ground, completing the other application before the seedling leaves have fully unrolled. An application of one and a half pounds per acre of

2,4-D at this time will hold nearly all weeds in check until the ground can be cultivated, no matter what the weather may be.

The History of Agricultural Fairs

Condensed from The Shorthorn World

Dr. Wayne C. Neely
Hood College, Maryland

THE year was 1810. The village of Pittsfield, Massachusetts, buzzed with excitement over "an appeal to the public" that had just been published. Elkanah Watson had finally succeeded in getting some twenty of his neighbors to join him in planning for The Berkshire Cattle Show, and the event the village was about to witness may be called the first agricultural fair to be held in America, of the type that has come in the intervening years to be a distinctive rural exhibition and festival.

These events that each fall act as a show window for agriculture, and climax a year of effort for the breeder, the homemaker, and the 4-H boy or girl have a longer history than most people realize. Fairs, like all institutions, proceed from many human motives, and reflect in every era the social and economic conditions of the time. They have a varied ancestry, woven of religion, commerce, industry, science, education, and recreation, which can be traced back to primitive times. Even so, Elkanah Watson, because he hit upon a novel plan of organizing local farmers into agricultural societies and holding annual exhibitions, has earned the title "Father of the agricultural fair."

The earliest forerunners of fairs were probably religious fetes. The word "fair" comes from the Latin *feria,* meaning "holiday," and the word "holiday" is merely another way of saying "holy day." Commercial activities were soon added, and for many centuries, before the days of retail trade, the bazaar or market was among the most important of economic institutions. Every village had its market day, a custom that still persists in the economically less developed sections of the world.

The Middle Ages saw many great national and international fairs (still markets, not exhibitions). After retail trade began to develop, the sample fair appeared. Still later the great international exposition or World's Fair became an advertising medium in the

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Aurora, New York, August 10, 1951

rivalries of modern industrial nations and cities. Fairs from the earliest times were undoubtedly also centers of social life, for there are many records of the curiosity seekers, peddlers, actors, acrobats, clowns, musicians, beggars, and other camp-followers that gravitated to these centers of excitement.

The village market fairs of England, it may be noted in passing, played a major role in the early breeding of Shorthorn cattle. The Colling Brothers and Thomas Booth, the first improvers of modern Shorthorns, found in the animals brought to the markets at Darlington, Yarm, and other villages many of the specimens which they chose to found and improve their herds.

Although the agricultural fair as we know it today owes something to all these sources, it traces more directly to that remarkable agricultural development that began in England two centuries ago known as the Agricultural Revolution.

The Agricultural Revolution was the period during which Robert Bakewell laid the foundations of modern purebred livestock breeding, and many other men, many of them prominent in public life, improved their flocks and herds, experimented with new crops and methods of cultivation, studied the tenancy problem, or established agricultural magazines. Even King George III, despite his troubles with the American colonies, found time to establish a model farm and to write for agricultural journals.

The scientific knowledge of agriculture grew rapidly, but at first it was possessed almost wholly by the socially elite. Experimentation became a fad of gentlemen farmers. They organized learned and exclusive agricultural societies, whose meetings were the occasion for scholarly papers, dignified speeches, witty toasts, and sumptuous banquets. They held fashionable events called "sheep shearings" and "plowing matches," at which they entertained their aristocratic friends.

It must be said, however, that these gentlemen farmers pioneered in the improvement of agriculture and the demonstrations of their experimental results to the public. They shouldered a responsibility that was later to be assumed by agricultural colleges, experiment stations, farm magazines, and governmental agencies. In time, democratization prevailed, and the ordinary farmers too were caught up in the progressive movements of the Agricultural Revolution.

Early agricultural development in America was similar to that in Europe. The colonies had their local market days. After 1776, Washington, Jefferson, Adams, Franklin, and other "founding

fathers," knowing of the improvements in English agriculture, sought to have the new methods adopted here. Between 1785 and 1800, agricultural societies were organized in all the leading cities. But like their English models, they were composed not of working farmers, but of merchants, lawyers, ministers, doctors, and other professional men and leaders in public life. They offered premiums quite beyond the reach of common farmers and held social events in which common people had little part.

Gentleman farmers in America, too, held "sheep shearings," the most famous of which began about 1803 at Arlington, Virginia, on the estate of George Washington Parke Custis, the adopted son of George Washington. Custis considered the growing of wool a patriotic duty, and at the sheep shearing he provided a few prizes for sheep, fleeces of wool, and woolens. One of the events he sponsored had a distinctly modern flavor—a sheep shearing contest, restricted, interestingly enough, to "native Americans."

But on the whole little progress appears yet to have been made to set up organizations or to start activities fitting the needs of common farmers. The fashionable meetings, technical reports, and elaborate experiments of the learned societies were inherently unsuited to appeal to the mass of farmers.

And so our story returns to Elkanah Watson and his Berkshire Cattle Show. Though the ordinary history books have passed him by, Watson was one of the most dynamic characters of early American history. Probably no other man of his day had so many interests, or had engaged in so many hobbies, promotion schemes, and business ventures. He traveled in Europe, made (and lost) a fortune in the mercantile business, studied foreign languages, and became a patron of the arts.

Returning to America in 1784, he became a leading business man and banker in Albany, New York. He promoted canals, free schools, turn-pikes, and other public works. Like Custis, he was an intense nationalist. He wished to see the United States freed completely from commercial dependence on Europe. This nationalism was typical of the times. Many leaders saw in domestic manufacture especially of cloth, an economic emancipation from England that would complete the political emancipation won by the Revolutionary War.

So it was that Watson bought a 250-acre farm at Pittsfield, in 1807, and became identified with the operation of woolen mills. Shrewdly he sought to improve the quality of the local wool supply, and secured a pair of the then rare and highly prized

Merino sheep, which he took to Pittsfield one autumn day and displayed on the public square. This event gave him the idea of creating a new type of agricultural society. He proposed a society that would include all the "respectable" farmers of the community, and would hold annual exhibitions.

The three years following 1807, Watson devoted to building up his estate, improving his livestock, and writing articles arguing the advantages of better farming and breeding. He advocated the raising of Merinos for their fine wool, secured some improved swine, and stocked his twenty-acre pond with pickerel. It is possible that he also was one of the first promoters of Shorthorn cattle, for he has recorded that he bought a young bull of the celebrated English stock . . . with a view to ameliorating the breed of cattle." It is known that Shorthorns were imported from England to New York some years previously, and that some good stock descended from them had been bred in the New York counties.

Watson's plan of organizing a so-called "practical" agricultural society, which would hold annual "cattle shows," was his major contribution to agriculture. One gathers that it took a good deal of wheedling and cajoling, however. There seems to have been no premium money available for the first show in 1810. When the hour arrived, the farmers suddenly turned bashful. They hesitated "for fear of being laughed at," said Watson, to bring their animals out for display. Only after he had led the way with several "prime animals" of his own did the show proceed to a successful conclusion.

But the event did culminate with what its promoter called "considerable eclat." A committee of farmers from all parts of the county was appointed to make plans for a show the following year. To close the day, Watson headed a procession of farmers marching around the village square, and before they separated, he stepped in front, led them in three cheers, and sent them off, as he said, "well pleased with the day, and with each other."

The second Berkshire Cattle Show was held in 1811. It was, by contrast with the first, so elaborate that it might be said that Watson created a full-fledged county fair in the course of a single year. The society, which had in the meantime been organized, with Watson as president naturally, urged farmers in a public notice to prepare their animals for exhibit, and asked manufacturers to send their best cloth and other wares. Prizes of $70 were awarded to the livestock. There was a mammoth parade, conducted by four marshals

headed by the sheriff and mounted on gray horses. The members of the society marched in a body, each wearing in his hat a cockade of wheat. Sixty yoke of oxen drew a plow held by two of the oldest men in the county. Two stage coaches containing manufactured goods and a loom and spinning jenny were contributed by local industry. A crowd of 3,000 or 4,000 people attended this spectacular affair.

Watson now felt sure he was on the right track. He knew the old learned societies with their philosophical discussions and technical papers had failed. By the same token, he felt the "practical" agricultural society and its annual fair to be eminently successful at the very point where the old societies were weak. The next few years saw this type of event growing in popularity. The premium lists were extended. "Innocent amusements"—including singing by the village choir and a grand agricultural ball—were added. The women were encouraged to display their products of loom and spinning wheel. A plowing match was organized. The minister was asked to open the ceremony with "pastoral prayers," and eventually the public lecture or "annual address" became a main feature.

Agricultural societies modeled on Watson's achieved great popularity in the mid-nineteenth century. They succeeded because common farmers could become members and because the fair afforded a spectacular educational and festive occasion in which they and their families could take part. Dues were kept low, and there were no learned dissertations to write. There was some attraction at the exhibition that appealed to every age, sex, and condition of the population.

Watson himself soon found Berkshire County, Massachusetts, too small a field for his new scheme. He sold his farm, and devoted the next few years to explaining his plan to public leaders and lobbying in the legislatures for state aid to fairs. And in 1820 he published a book, "History of the Agricultural Societies on the Modern Berkshire System," from which many of the details of this story are taken.

Most of the counties of New England soon had their agricultural societies, each with its fair, and the movement spread rapidly over the next few decades to the South and the Middle Western frontier states. By the 1830's state fairs were being held. The period of 1850 to 1870 came to be known in agricultural history as the "golden age of the agricultural fair," because of the rapidity with which fairs sprang up.

When the fall fairs open, the excitement is hardly conducive to reflections on their early history.

But the agricultural industry would find it strange to function without their stimulation. The story of their origin, colorful as the fair itself, is part of the heritage of breeders and farmers . . . as fairs themselves are part of the rich culture of rural America.

Hunting Identical Twins in New Zealand

Condensed from Guernsey Breeders' Journal

Dr. Charles W. Turner
University of Missouri

"We are from the Ruakura Station and have come out to see your twins. This is Dr. Turner with me who has come over from America." Thus, I was introduced to my first New Zealand "cow cocky."

For a number of years I had been hearing of the fine research work being conducted at the Ruakura Animal Research Station of the Department of Agriculture of New Zealand. The reason why the work had gained world wide recognition had been due to the fact that at this one station they had gathered together about 200 pairs of identical twins which are outstanding experimental animals for all types of dairy research due to the fact that the inheritance for all of their traits is identical. Thus, instead of requiring 15 or 20 animals in a group in normal research work it has been calculated for many purposes that equally as reliable results can be obtained with one pair of identical twins.

In addition, in New Zealand the dairy industry is based upon a pasture system and by having cows calve at the same time in the early spring the pairs of identical twins also are subjected to very similar environmental conditions. Thus the Ruakura Station had a great fascination for me because of my interest in the effects of various hormone treatments which might be administered to one of a pair of identical twins to see the effect upon their subsequent milk and fat production.

I found that I could realize my ambition to come out to New Zealand through the Fulbright Award scheme and a sabbatical leave of absence from the University of Missouri which has permitted me to make this trip half way around the world to these beautiful Islands "down under." At Auckland, New Zealand, we were met at the airport by Dr. C. P. McMeeken, Superintendent

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of the Ruakura Station. The warmth of his welcome was in sharp contrast to the chill in the air. After enjoying the 85° F weather in Honolulu, Auckland with several "degrees of frost" made overcoats feel good. When we arrived on August 12, New Zealand was experiencing one of its coldest winters in some years and without centrally heated hotels our reception in New Zealand was a rather cold one. However, the next morning when we drove from Auckland down to Hamilton, some 90 miles south, we were amazed to see the rolling hills and flat land covered with luxuriant pasture on which were grazing hundreds of dairy cattle and thousands of sheep. We began to appreciate the reason why New Zealand has been called the "dairy farm of the British Commonwealth." Flowers and shrubs were in bloom in all of the gorgeous colors of the spectrum, and to our amazement citrus fruits, including huge lemons and a New Zealand variety of grapefruit, hung in abundance on the trees.

Hamilton, a beautiful, modern city of 33,000, and the home of the Ruakura Station, is a fine, progressive city situated on the beautiful Waikato River in the center of the most intensive dairy area in the world, for within a radius of 20 miles of Hamilton there are 160,000 dairy cows and within a radius of 40 miles 320,000 cows. Most of these cows have never received grain feed of any kind, living entirely on pasture, supplemented for a short period of unfavorable growth by the preservation of the surplus pasture in the form of silage or dry grass. The economy of the milk and fat production under such conditions can be realized.

The dairy farmers, under the prevailing prices obtained for their butter and cheese in the English market, have become very prosperous indeed and beautiful farm homes with a backdrop of rolling pastures are a very common sight as one drives through the country-side. A milking shed, with a milking machine situated in the center of a typical hundred acre farm, is all of the barn equipment these dairymen require. The cows are rotated on the pastures, not only by permanent fences but also into smaller areas by means of temporary electric fences so that they graze only for a period of a day or two on any given area. The rainfalls are usually frequent. I am told that seldom a week passes without a good shower. By the rotational grazing scheme the cows are kept more or less constantly on luxuriant pastures of clover and grasses.

With this large cow population it is no wonder that it has become the center of an identical twin collecting station. It is estimated that only one pair of identical

twins is produced for each two to three thousand calving. These twins, always of the same sex, only occur when a fertilized egg divides soon after conception and forms two individuals instead of the usual one. Since they come from a single egg all of the factors of inheritance are identical.

The dairymen of New Zealand are extremely proud of the accomplishment of the Ruakura Station and as a result of articles in the newspapers, radio, and meetings the need of the Station for identical twins is known throughout the country. Whenever like sexed twins are born which appear to be quite similar in general appearance a "toll" call is sent to Ruakura giving the location of the dairyman. Fortunately, practically all of the cows are bred to calve in the early spring so that during a period of several months most of the identical twins are collected.

When I arrived in New Zealand collections were in full force and it was with great pleasure that I had an opportunity to go out with Mr. Bruce Quigley, who was supervising the collection program. A truck is available with several crates aboard and each morning the calls of the day before are tabulated and a route mapped out. The first day that I was taken out we drove about 10 or 12 miles from the Station and I had an opportunity to meet my first "cow cocky," as New Zealand dairymen are called. He was a retired dairyman who was born on the farm which he owned and had cleared it of the native "bush" years before. His son was operating the farm. The twins were little Jerseys and it was quite a thrill for me to have Mr. Quigley go over them in detail in order to determine whether or not they were identical. "One of the first considerations is the color of the coat," said Mr. Quigley. If the color of the two is not extremely similar they are usually not identical. I found that spotting need not always be exactly symmetrical, but in most identical twins it was often found quite similar.

Next, the conformation of the head was noted. Were the two heads similar in appearance? If so, the examiner then turned to such points as the whorls of hair in the middle of the forehead and others on the top line of the back. Next, the pigmentation of the ears and the tongue was examined. I found that more attention was paid to possible differences than was paid to similarity because apparently many fraternal twins also have many points of similarity and, therefore, the differences play a major role in the decision of the examiner as to their identity. Fortunately, for me, the first twins I saw happened to be identical and it was a real thrill to see these

two calves that I had come so far to learn about. However, not every time were we so fortunate and many times we had to tell the dairyman that we were sorry but they were not identical twins. After a few experiences I made my first examination and as I progressed in gaining experience I soon felt that I could pick out the identical twins without serious error. I discovered that even the experts at Ruakura, who have examined thousands of twins and hundreds of identical twins, make a mistake once in a while, but they are very rare even though the calves are usually examined when only a day or two old. A number of characteristics which appear later add to the surety of the early identification.

Many types of experiments are underway with these twin calves and the cows they later develop into. It is surprising how similar is the growth rate of identical twins when under similar conditions of management. It is this fact which makes them so valuable since when placed under different conditions, such as reduced feed intake, the influence on the growth rate is determined.

Frequently, the calves and cows are watched day and night on pasture to determine how much time they spend in grazing, chewing their cud, lying down and loafing. Again it is interesting to note that the pairs usually graze together and spend about the same amount of time grazing and walk about the same distance in the paddock.

Since New Zealand dairying is dependent upon pastures, a great deal of research is being conducted here on methods of measuring the feed intake of cattle on pasture. It is not easy. One system being tried is to give the cow a capsule containing chromium oxide after milking and find out how much it is diluted in the digestive tract. Another is to cut the grass and feed it in stalls.

At Ruakura Mr. Whittleston has devised equipment for measuring the rate of removing milk from the cow's udder. Every cow in his special herd has such a record made at every milking. All this goes on without the cow knowing anything about it. He has found out that any disturbance in the milking shed upsets the cows and the rate of "letting down" the milk is altered. Cows milk at different rates, but identical twins usually have similar milking characteristics.

Studies with identical-twin cattle will contribute, a great deal to dairy science over the years. It is a thrilling experience for me to have this opportunity to see the work going on here at first hand. The vision of Senator Fulbright in devising the scheme, of Congress in approving, and of the State Department in supervising

the teachers, research workers, and students abroad have together made this one of the best programs of value not only to the individual recipient of the award but to the host institution as well.

Housewife's Choice

Condensed from The Farmer

Robert G. Rupp

HERE is a newcomer to turkeydom—the Beltsville White. Small and fast maturing, Beltsvilles are adding a fryer or broiler sized bird to the housewife's choice of big turkey, little turkey, half a turkey, boned turkey logs (turkey pressed into cylinders of either white or dark meat), turkey-burgers or turkey filets.

Beltsvilles have been of commercial importance only within the past three years. B. J. Tobin of Swift and Co., one of the nation's top economists, estimates seven million Beltsvilles were marketed in 1951, three and one-half times as many as in 1950.

Dr. W. A. Billings, University of Minnesota turkey authority says that he wouldn't be surprised if the nation raised 25 or 30 million in the next few years. The turkey fryer is catching on fast. Housewives like them. They are competing with chicken roasters.

There is reason for this kind of optimism. Beltsvilles are taking some of the gamble out of turkey raising. They are making production a year-round business and are putting money in farmers pockets while doing it.

They have already been credited with helping put turkey on tables 12 months of the year. Fifteen years ago, 90% of all turkeys were eaten at Thanksgiving and Christmas. Now the proportion is around 65%.

Beltsvilles grow to six or seven pounds in 12 to 14 weeks. They convert feed to flesh at the rate of two and one-half to three pounds of feed per pound of gain.

That kind of turnover means something to turkey raisers. It spells more efficient use of brooding equipment and lower capital investment. It means birds can be marketed right out of the brooder house at a very efficient feed conversion rate.

To quote from the official publication of the Minnesota Turkey Growers Association, "Until the advent of the turkey broiler, the average brooder house was used

Reprinted by permission from The Farmer, Saint Paul, Minnesota, December 1, 1951

only about three months a year, possibly four or five if two broods were started. Today, many growers raise one brood of broilers before the heavy Bronze are started, then fill the houses with another batch when the Bronze go to range.

This makes for a nine- or ten-month operation without increasing the need for help."

Nick Marnach, Winona County, Minnesota, offers a good example of a farmer who is making turkey raising a year-round business. He started with 2,000 Broad-Breasted Bronze poults last spring, had them out of the brooder houses by mid-June. Ten days later 1200 Beltsvilles went in. They were there three months, then went to the Altura Rex dressing plant in nearby Altura. In early October another 1200 Beltsvilles were put into the brooder houses. They hit seven pounds just in time for the Christmas market. A breeding flock will be in the houses during the winter months.

About 50 farmers in the Winona County area are operating that same way. This year they supplied between 150,000 and 175,000 heavy Bronze to the Altura Rex plant, and supplemented their projects with another 150,000 Beltsvilles. Small turkeys have been processed at Altura every week since April.

What does a farmer need to raise turkey broilers?

First, as with chicken broilers, he must have volume. A raiser should be set up to turn out 2,000 birds every three months. Either that or fit broilers into his heavy turkey program.

He needs volume because there isn't the return per head. You can't make the $1 per bird profit you do on heavies. The average is more like 50 cents per bird. In fact, over a period of the past two years, production records on small whites show growers had a return of 25 to 75 cents per bird. The average price for poults was 60 cents, feed costs $5 per hundred, corn and oats $3 per hundred during that time. Live price of birds was 38 to 41 cents per pound.

A well-insulated brooder house is necessary for winter operation.

Ed Puetz, manager of the Simon farm feeds broilers a 25% protein pelleted concentrate, ground corn and whole oats. They are on built-up litter, which is cleaned out after each brood and the houses scrubbed and disinfected.

All poults are debeaked. Cannibalism is a definite threat in small whites. Not as many birds can go into the same brooder as Bronze, partly because of their color and partly because they must be kept confined longer at a time when each bird takes more space.

Mortality runs about 6% for

Puetz, which is a shade under average for most producers.

Puetz and one hired man take care of the 17,000 turkeys and handle a 1,000-bird breeding flock in the winter. They also care for 30 acres of corn, 80 hogs, and 50 beef cattle on the 240-acre farm.

Sullivan figures one man with proper equipment can handle a 10,000 bird flock. Two thousand broilers take about the same amount of work as 500 laying hens.

In addition to the cannibalism, there are a couple of other factors to consider before plunging into the turkey broiler business. Disease is a constant threat where large numbers are closely confined. Coccidiosis especially must be watched while poults are young.

It is also important to know your market before you start. Georgia producers turned out a lot of birds this year without first establishing their market. They are now reported to be dumping birds at a discount.

"Don't raise turkey fryers unless you have a nearby processor who knows how to properly merchandise them," says Dr. Billings. "He should be an eviscerator, because it's a shame to sell turkey fryers with long neck and gangling legs left on. If you live far from an outlet you will probably be far better off to stick to the heavy turkey."

However, where conditions are right, the broiler picture looks good. Demand is strong. Producers right now can't supply current orders. While price margins may be shaved a little as production builds up, small turkeys offer much as a supplemental industry.

The housewife has indicated her choice. She'll buy turkey all year long if it's available, conveniently packaged, and sold at a price competitive with other meat.

The producer appears to be making his choice. Says, Dr. Billings, "there is only one thing that will hold numbers down. That is availability of eggs and poults."

Mastitis Germs Live in Barns for Days

Here's another reason why mastitis is so hard to get rid of: veterinarians have just come up with the news that mastitis germs may live around the barn for 20 days, on floors, walls, and equipment. The germs may live even longer on a cow's skin.

The old idea of regular cleaning and disinfecting looks more sensible than ever.

—Farm Journal

Outwitting Mastitis

Condensed from Minnesota Farm & Home Science

Dr. William E. Petersen
Professor of Dairy Husbandry, University of Minnesota

TODAY, mastitis is the most costly disease of dairy cows! It is often hard to detect and difficult to control. It may be taking many dollars from your pocket right now.

Mastitis is a complex disease. It varies greatly in its causes and symptoms. By definition, it is inflammation of the udder. An attack may be so mild that it can be detected only by laboratory tests, or it may be so severe that the cow will die. Some cases last only a short time with quick recovery and little permanent injury. Usually, there are recurrences of the flare-ups, each with additional permanent damage (in which the secretory tissue is replaced by fibrous non-secretory tissue). In other cases, the first attack will destroy the secretory tissue and the quarter will not give milk until the next freshening. In some severe attacks, scar tissue may take over the injured quarter completely and the quarter may cease to give milk, or the entire quarter even may be sloughed off.

Microorganisms are involved in nearly all cases of mastitis. The kinds and actions of these microorganisms, however, are many and varied. Some of these microorganisms are infectious, and it is possible to free a herd of them. Others are about the cow and premises at all times and cannot be eliminated. Some that produce the most severe mastitis are natural inhabitants of the digestive tract; others are found elsewhere in the cow's body.

Some microorganisms produce mastitis by the toxins they produce. In our university laboratories we grew these organisms in sterile whey. Then we filtered out the bacteria and produced severe mastitis and sick animals by injecting animals with a few teaspoonfuls of what remained. Whenever mastitis is caused by toxin-producing organisms, the animal becomes ill with fever.

At present, our experiments in progress indicate that some mastitis may result from an allergy reaction. Here the bacteria themselves do not injure the udder cells but stimulate the production of antibodies that help produce mastitis. Other organisms directly

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damage the udder.

Since all cows are contaminated at all times with microorganisms that can bring on mastitis, it is obvious that presence of bacteria alone is not enough to produce the disease in all cases. If it did, all cows would have the disease. Some other condition also must be present for the disease to develop.

The most common condition is injury to the delicate structures inside the teat and udder. When these membranes are broken, bacteria have no trouble in establishing themselves in the damaged area and rapidly spreading to the entire quarter.

There is a little evidence that many microorganisms introduced inside the teat produce mastitis unless there are injured tissues there. It may be possible that some organisms are so strong that they might establish themselves when introduced in small numbers where there once had been an injury.

Knowing these facts, we can see that the only way of really controlling the disease is to prevent it. Once an udder has been attacked, there is permanent, irreparable damage. What's more, there also is evidence that a gland once damaged is more subject to reinfection.

Since some forms of mastitis are passed directly from infected to healthy cows, the first step in control is to prevent such transfer.

To do this:

Milk infected cows last.

Thoroughly clean and sterilize both the milking machine and your hands before milking the healthy cows.

Don't allow milk from infected cows to come into contact with healthy cows.

Use disinfectants wisely.

Preventing injuries to udders and teats is one of the most important steps in stopping mastitis on the farm. This is not always easy because there are many ways in the average herd for the teats and udders to become injured.

One of the most common ways they are injured is through poor use of the milking machine. Be sure that the cow is stimulated to let down her milk before the machine is attached and then remove it as soon as milk ceases to flow. While milk flows through the end of the teat due to the action of the milking machine, no force is exerted on the inside of the teat. As soon as the milk ceases to flow, however, the vacuum in the milking machine extends to the inside of the teat, breaking the lining inside the teat and in the lower part of the udder. At this stage, too, the tissues at the lower part of the udder have become soft and flabby and are drawn into the milking machine. These tissues may then rub against one another with possible great damage. Many herd owners tell us that when they

adopted good milking management, they cut down mastitis greatly.

Wrong size stalls also may injure udders. Too narrow stalls often cause a cow to step on her own teats or the lower part of her udder. Too short platforms may allow the cow's udder to extend over the end of the platform when she is lying down or may force her to stand with her hind legs in the gutter. When she gets up on the platform, she may injure herself.

Slippery walks in the barn causing the cows to fall, or high door sills over which the teats and the lower part of the udder may be dragged can cause serious injuries. If there is no platform outside the barn door and the approach is muddy, the cows may be hurt going into the barn.

Remove obstructions in the yard and the pastures that cause injury to the teat and the udder. One farmer had nearly 100 per cent mastitis infection in his herd when he cut his brush pasture and left sharp edges high enough to cause injuries to the teats and udders. Brambles in the pastures or lanes can cause injuries to the ends of the teats. Thus, infection may become established and extend up through the teats into the udder.

All our investigations indicate that there is no relationship between feeds and mastitis. They show, too, that certain feeds do not help to control mastitis once it has become established. The only possible relationship between feed and mastitis (and this is not established) is that well fed cows are heavier producers and have larger udders and, therefore, may be more subject to injury and subsequent infection.

Under the best of conditions, accidents will happen and mastitis develop. There are now many drugs, principally antibiotics, that are of real value in treating mastitis. The antibiotics, or any drug now used in the treatment of mastitis, have for their purpose the destruction of the microorganism that is causing the inflammation. Limitations in effectiveness of treatment in some cases then become obvious. Remember that the microorganisms are spread through the entire gland, and that, because of the inflammation, the ducts are closed. Therefore, the drug cannot reach all of the microorganisms, and so we cannot expect all cases to respond to treatment. In using drugs, follow these rules:

1. Start treatment early, before inflammation becomes so extensive that it blocks the channels in the udder and also before serious damage is done to the secretory tissue.

2. Use enough of the drug to get maximum benefit. The more milk a cow produces, the greater must be the dosage of the drug.

3. Be sure to keep all instruments and equipment absolutely clean and aseptic.

4. Discontinue milking for 24 hours: The reason for this is that the drugs, especially the antibiotics, will remain in the udder in good concentration for 24 or more hours. Missing one milking will not have any harmful effect upon later production but it will enable the drug you've administered to come into closer contact with all areas of the gland.

5. Leave treatment of as highly complex a disease as mastitis to one who is skilled in diagnosis and drug administration—the veterinarian.

Treatment alone is not a solution to mastitis, but when used with other controls, namely prevention, it is a valuable part of the program. Those who use treatment only often have had more mastitis. The reason for this is that it helps keep infected animals in the herd for a longer time. These animals are more susceptible to reinfection and consequently, more cases for treatment appear. Farmers, however, who have improved their milking management and adjusted their stalls to the cows, those who have used deep bedding to cut down on injuries and those who have removed obstacles from yards, lanes and walks have had large reductions in mastitis.

Ways to Shift to Grass Silage

Milk production is likely to suffer during the change-over from corn silage to grass silage, especially if the change is made suddenly.

John Kitchen, dairy-research specialist at the Rutgers Agricultural Experiment Station, suggests three ways of preventing this loss of milk production.

The first and most convenient way is to feed additional grain. However, this is likely to be too expensive at the present high cost of grains.

The second method is to feed a liberal amount of the best hay available during the change-over. The extra hay, Kitchen explains, helps to make up for the lower silage consumption, keeping milk production on an even basis.

The third method, and probably the best, is to start feeding small quantities of grass silage a week or 10 days before the corn silage is all fed out. Keep increasing the grass silage and decreasing the corn silage until the change-over is complete. This is sometimes hard to carry out, Kitchen admits, as a farmer will need two silos, one containing corn and the other grass silage.

—Successful Farming

How to Buy a Well

Condensed from Electricity on the Farm

Clyde Walker

PEOPLE are generally familiar with the things they buy and consequently they usually obtain their moneys' worth when making a purchase. But wells are another matter. Most persons seldom "buy" more than one or two wells in a lifetime; some never buy even one. Hence it is not surprising that few people know how to proceed when "buying" a well.

A well may be defined as a permanent direct connection between the ground surface and the water in earth formations beneath. However, simple as this sounds, there is much more involved in constructing a well than just drilling a hole and inserting a casing. This makes it important that a capable and reliable well contractor be employed.

In addition to drilling a straight, true hole, the driller must be able to secure the maximum production from water-bearing formations encountered. He must decide how much casing to use; whether perforations are needed; and if so, where. He must know how to develop the well and how to test it. This calls for experience and judgment, plus genuine interest in his occupation and pride in his workmanship.

One of the first questions to be decided is how much water is needed from the well-to-be. Is the water to be used only for the household, or is there lawn and garden sprinkling and livestock water to be considered? Field irrigation requires water in vastly greater quantities than domestic or livestock use. For this reason irrigation wells represent a different problem than wells to supply the farmstead alone.

Below are some figures that can be used as a guide in estimating the water requirements for various combinations of circumstances:

Modern home, per person	35	gals. per day
Milk Cow	35	" " "
Work horse or beef animal	12	" " "
Hog	4	" " "
Sheep	2	" " "
100 Chickens	4	" " "
100 Turkeys	7	" " "
To supply a ½" hose	200	gals. per hour
To supply a ¾" hose	300	gals. per hour

For field irrigation use with sprinklers a supply of from five to seven gallons or more per minute is required for each acre to be irrigated. This is determined by the crop, kind of soil, and other fac-

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New York City, New York, December 1951

tors. The local county agricultural agent, irrigation equipment dealer or power supplier's representative can supply information on requirements for their territories.

In some areas a well can be drilled at almost any point with a reasonable assurance of obtaining water. In other localities adequate ground water supplies are lacking.

Before drilling, obtain figures on the depth and capacity of nearby wells. Also seek information on the depth and extent of water-bearing formations, whenever possible. Discuss the matter with local well drillers and find what their experiences have been with wells in your neighborhood.

There is always a certain degree of risk involved in constructing a well. It is advisable to reduce this risk as much as possible by obtaining all available information before deciding on the well location and actually starting the work.

When selecting a well contractor it pays to deal with a reliable individual or firm that can be depended upon to do a workmanlike job.

Wells are expensive and there is a natural inclination to hire the driller who quotes the lowest price. However, the cut-rate operator may prove to be the most expensive in the long run. He may fail to construct the best well possible under the circumstances.

Before the contractor begins operations, have a definite understanding with him, as to rate of pay and all other details. These include well diameter, length of casing to be installed, and testing the well to determine capacity and drawdown. Constructing a well involves far more than making a hole in the ground and inserting a length of casing. If water is obtained from sand or gravel formations, the process of developing the well requires as much skill as the process of making the hole. If properly done, it may consume as much time.

Many well contractors do not use written contracts, but it is best to do so. An oral agreement may leave the way open for serious misunderstandings later on. The mere preparation of a written contract is worth while. It brings to the attention of both parties points that might otherwise be overlooked and later provide a basis for disagreement.

Most contractors will not make any guarantee as to the quantity or quality of water to be produced by a well. However, there are many other details which need to be covered in an agreement between the farmer and the well contractor. Here are some of the questions that should be discussed and agreed upon by the parties concerned:

1. Where is the well to be drilled? Will any crops be damaged by the drilling operation, and

if so, who is to assume the loss?

2. What is to be the diameter of the well, and at what depth will drilling cease if water is not obtained?

3. What size, kind and weight of casing is to be used?

4. How much, if any, sand is to be tolerated in water from the finished well?

5. When is the well to be considered completed? Who is to test it, and how?

6. What rate is to be paid for drilling? Is casing included in the price? Is completing and testing included in the price? What are the terms of payment?

7. Will the driller guarantee a hole sufficiently true to permit installation of a pump?

8. Will the driller supply the owner with an accurate log of the well, and copy of the test records?

9. Will the driller clean up around the well when finished?

10. Does the well contractor carry liability insurance?

11. Who is to furnish board and lodging for the crew, if needed?

12. Will any adjustment be made on drilling charges in case of a dry hole?

Several different kinds of equipment are used in constructing wells, ranging all the way from modified "post-hole" augers to heavy duty hydraulic rotary or percussion machines.

Hydraulic rotary machines use a revolving bit driven by a hollow vertical shaft. A mud solution is pumped down the shaft and out through holes in the bit. This gives a jetting action that aids the bit in loosening the earth material. It also carries the drillings to the top of the hole. From the top of the hole the mixture flows to a sump or settling basin where it deposits much of the material. From the sump the liquid is sucked up by the pump and recirculated through the well. When it becomes too thick it is discharged to one side and fresh water added to the system to maintain a workable mixture.

Percussion drills use a heavy drill bit. This is mounted on a cable passing over a sheave on top of a vertical mast and down to the operating mechanism. The mechanism alternately lifts and drops the drill, producing a cuting or drilling action at the bottom of the hole. Water is added to form a mixture with the material loosened by the drill. The mixture is removed from the hole at intervals with a bailer. This is a slender bucket with a valve in the bottom to admit the mixture and retain it when the bailer is hoisted to the surface, where it is dumped at one side.

All types of machines have certain advantages and disadvantages. As a rule the machine owner will know whether or not his rig will do the job under the conditions found on any certain loca-

tion.

When the drill hole has penetrated one or more water-bearing formations the problem arises of how to obtain the maximum yield. As an example of a well development problem, let us consider a domestic well drilled to a depth of 100 feet. It goes down through clay to a layer of fine water-bearing sand. The owner had decided that he needed a flow of at least 10 gallons per minute.

When the hole entered the sand, water arose to within 40 feet of the top of the well. With his bailer, the driller removed water from the hole at the rate of 10 gallons per minute, which lowered the water level to 90′ from the top. A considerable quantity of fine sand was removed along with the water.

The next procedure would be to install a test pump and pump the well at a rate of 8 to 10 gallons per minute until no more sand was obtained. Then increase the pumping rate gradually and continue until 15 to 20 gallons per minute were obtained with little or no sand. The purpose is to remove enough sand to form a cavity. This should be large enough to permit the desired amount of water to seep through the sand at its sides without attaining enough velocity to carry the finest sand particles along with the water. Generally it is best not to increase the pumping rate too rapidly. This might cause a cave-in of the cavity already formed, and plug the pump. Sometimes it may be necessary to pump a well for several days, or even longer. The writer has observed irrigation wells that were pumped for over two weeks before the contractor considered them properly developed. This is just one method of developing a well. There are others.

The next step will vary with conditions and the experience of the contractor under similar circumstances. Sometimes it is best to install the pump suction pipe in the well, with a screen on the bottom, and pour gravel into the well until the cavity around the pipe is filled. In other instances the well is cased to the top of the sand formation, and the pump suction pipe installed with the end projecting slightly below the casing, without a screen. This is less expensive and may be satisfactory as long as the sand around the cavity remains in place.

As stated before, the exact procedure that is best for any given set of conditions is a debatable topic. Differences of opinion will be found between various drillers as to the best method. The point emphasized here is that drilling the hole is only a part of constructing a well. Development of the well after the hole is drilled is extremely important. What's more, expert workmanship at this point can mean the difference be-

tween a good well and an unsatisfactory one, or even no well at all.

The capacity or output of a well may be checked by removing water with the bailer on the drilling rig, or by pumping. For domestic wells bailer testing is usually adequate. For wells of more than 20 to 30 gpm output it is better to install a test pump and measure the output under actual pumping conditions. For an irrigation well, adequate testing is especially important. It is impossible to intelligently order a pump for a well until the output and drawdown are known.

As far as the owner is concerned, he starts with a site for the well and hopes to conclude with a pump and related equipment ready to operate. He should have a definite understanding with both the well contractor and the pump dealer as to where the responsibility of the contractor ends and the dealer's begins. As a general rule, the driller should leave the well ready for the installation of the pump and equipment. If he does not do so, the farmer may find that there is a gap between the driller and dealer which he had not anticipated. The owner may have to bridge this himself. If he wishes to perform such jobs as hiring a test pump or installing a concrete pump foundation, that is his privilege. But he should know beforehand that such will be the case.

So if you are planning on buying a well study the problems involved before taking action. You'll find it less expensive and more satisfactory in every way if you carefully plan the whole layout before actual drilling begins.

Careful planning will insure the best results obtainable from the ground water supplies that are available at the well location.

When to Harvest Brome

How can you tell when it will pay to harvest brome seed? Iowa State College agronomists offer a rule of thumb method for estimating yield. As a rule, they say, one head of brome seed per square yard will result in about one pound of seed an acre. This figure may be higher if the field had nitrogen fertilizer. It may be less if the grass was clipped or pastured earlier.

Iowa experiments on fertilized brome, in clipped plots with careful harvesting, have given yields that figured out 1¼ to 1½ pounds of seed an acre for each head in an average square yard of grass. Brome seed may be combined when the panicle and upper 3 inches of the stem are yellow or brown. In Iowa brome is usually ready for harvest from middle to late July. Seed yields run from 200 to 700 pounds an acre.

Parasites Take Sheepman's Profit

Condensed from The Sheepman

A. L. Pope
University of Wisconsin

HAVE you given your pint of blood to the Red Cross? They probably took it, doted over you for five minutes expecting you to faint from shock and told you not to think of giving more for several months. You needed the time to recuperate.

If lambs could see us go through this ordeal and the attention we get afterward, they'd be amazed. Give blood by the pint ! ! They give it by the quart.

A year ago at the Wisconsin Agricultural Experiment Station an experiment was conducted to determine the amount of blood lost by lambs that were heavily parasitized with *Haemonchus contortus,* commonly known as the stomach worm. This is the most damaging internal parasite because of its bloodsucking habit, and these lambs lost an average of eight quarts (16 pounds) of blood in a six-week period. At the time when the infection was greatest they lost over seven ounces, or nearly ½ pint of blood a day. These were 50-pound lambs and it is estimated that eight per cent of lambs weight is blood so that they had roughly four pounds of blood when the bleeding started. However, by the end of 42 days they had lost 16 pounds of blood, or four times their total supply. Despite this tremendous blood loss these lambs remained on feed and made surprisingly good gains. It seems astounding that an animal can be subjected to such stress and yet grow profitably—but it is happening in flock after flock, day after day.

How would they grow without internal parasites? Nobody knows, for there are 40 different kinds of these pests found in United States sheep and all sheep harbor some. It seems reasonable to suspect though that their increased efficiency of growth and production would be unbelievable.

When one stops to realize the seriousness of this damage the foremost question always is—what's the solution? Needless to say, it will not be simple because the problem is too complex. Frankly, the only sound solution in the long run will come when we find out more about the parasites themselves, their life habits,

Reprinted by permission from The Sheepman,
Lexington, Kentucky, December 1951

their specific effect on the animal, and how we can disrupt this parasite-host relationship so convenient to one and so harmful to the other.

To date we have approached the problem from the wrong side. Emphasis during the past 20 years has been on anthelmintics, drenches, or drugs as a cure to the problem. Researchers have directed their efforts toward finding a new drug that is more poisonous than the old. Sheepmen are then told in encouraging words of the efficacy of this new compound. It seems to me that this approach is wrong for several reasons. One is that any compound that is sufficiently poisonous to kill parasites within the host will do that host no good. There is experimental evidence to bear this out. Secondly, the futility of depending solely on a drench or anthelmintic to solve the problem is borne out by the following facts. Assume a ewe has an average load of 8,000 stomach worms. If the drench is 90 per cent effective it has done an exceptionally good job and has thereby removed 7,200 worms. Of the 800 worms left there are supposedly 400 males and 400 females. The average female worm produces 5,000 eggs per day and so this drenched ewe still continues to pass 2,000,000 (400 × 5,000) eggs daily in her feces. If there are 40 ewes in the flock these ewes will be dropping 80,000,000 eggs per day for their lambs to pick up despite a thorough drenching job.

The third reason why we should not lean as heavily on toxic drenches and powders to solve the problem is that too many practices that could have prevented the infection are neglected as a result. The sheep raiser thinks that he need not worry about important management or feeding steps because the drenches and powders have done the job. The scientist spends his time studying the efficiency of the poison and neglects or fails entirely to study the basic action of the parasite. For example, almost nothing is known of the nutritional requirements of the common stomach worm, or the effect of a lamb's age, weight, or diet on its resistance to this pest. If we are to produce lambs with a minimum of damage from these parasites, these seem to be things we ought to know about.

It has been shown recently at this station that nutrition can be an important factor in protecting a lamb against stomach worms. In a recent study lambs receiving cobalt and bone meal withstood stomach worm infection much better than the check group, probably because of these important raw materials being readily available in the salt for the manufacture of new blood. The lambs receiving these minerals weighed 68

per cent more two months after the infection as compared to the lambs that did not receive them. No lambs were killed by the worms where cobalt and bone meal were fed—30 per cent were when they were not. Theoretically there was more than enough of these minerals in the feed under normal conditions but when the lambs started losing ½ pint of blood a day from the worms, extra or emergency supplies in the salt helped.

During the past six years that this experiment has been under way there have been many interesting observations that need further study. It has been observed that the age of the lambs affect their resistance and that they quickly immunize themselves following small infections. Some lambs seem to have inherited more resistance than others, which could open a whole new field of study toward solving the problem. The feed fed the lamb definitely affects the size of the worm, their egg production, and their longevity. Parasitism seems to affect rumen synthesis and vice versa.

The sheep raiser likewise needs to be ever mindful of steps he can take to prevent parasitism in his flock from becoming a problem or reaching a point where drugs are necessary. He should know which preventive method can be of most value at different seasons of the year, for there is no substitute for good management and feeding in a parasite control program. Clean water tubs and feed troughs plus plenty of bedding can almost eliminate the parasite load in the winter. A good sized feed bucket, trace mineralized salt, and good quality alfalfa hay helps too. Pasture rotation, weaning the lambs at 4½ months, and providing them "fresh" pasture the rest of the season will be the start of an effective control in the summer.

Each year livestock producers are called upon for more and more production to feed and clothe a steadily increasing population. Because of the short supply, sheepmen need even greater production than the raisers of other livestock. It cannot be done if lambs have to use feed to make blood for parasites and thereby operate at a very low efficiency. It can be done however as we gather more and more fundamental facts and apply them wisely.

Milking machine saves an average of 700 man-hours in a year. That's around 500 million hours for the 714,000 machines now in use in the nation.

Prevent Production Drops

Condensed from American Poultry Journal

G. T. Klein
University of Massachusetts

At $5.00 a hundred for feed, a flock laying 75% will produce a dozen eggs for a cash cost of 26 cents. A flock laying but 40% has a cost of 44 cents, and one laying but 10% cannot do the job for less than $1.56 a dozen.

A 75% rate calls for stock bred to lay, plus luck, good planning and all it takes to keep a flock in good health. Given these, the rest is easy.

Handling flocks hatched in different months of the year is just a little different for each. The easiest to keep laying at top speed are the normal spring hatches; the most difficult are the winter hatches, and the late spring or summer birds are likely to be slow in hitting their maximum stride.

As a rough guide, this table gives the amount of feed birds consume at different rates of lay. It is for a bird weighing 5½ to 6½ lbs. Lighter or heavier birds would vary 2 to 3 lbs. either way.

FEED REQUIREMENTS OF 100 HEAVY BREED HENS PER DAY

Eggs Per Day	Lbs. Feed Per Day
0	25
10	26
20	27
30	28
40	29
50	30
60	31
70	32
80	33
90	34

While daily weighing of feed looks like unnecessary detail, a check on feed consumption from time to time is mighty important information to have. If it is greatly different from the figures given in the accompanying table, it is a warning that a check-up on the cause is in order. Feed consumption under these amounts will soon give a production drop; a higher rate is likely to mean feed wasted in the litter or help from rats or mice.

Tests over a period of years indicate that there is little difference in the production from all-mash or complete feeding and the feeding of grain and mash. For one who must buy everything, there is little difference in cost. Where grain is farm grown, there is a saving by using the grain and mash method.

The Poultry Department at the Univ. of Massachusetts experimented with different proportions

Reprinted by permission from American Poultry Journal, Chicago, Illinois, December 1951

of grain and mash. For years, it seemed that there was no marked difference in the rate of production when grain and mash were fed in about equal quantities and when the grain greatly outweighed the mash.

The summer production, the bird condition, and shell quality leads us now to believe that it is better to hold the grain and mash ratio at about a 50-50 ratio until May 1. Then, the grain should be cut and the mash increased to about a 40-60 ratio.

Requirements of different breeds and strains seem to vary considerably. This makes it very hard to give a definite recommendation that can be followed in feeding all flocks. The day by day consumption will give a lead on what is necessary.

We have not reached the stage in poultry breeding when December, January, and early February birds can consistently be carried through the winter without a neck molt and pause in production. Some strains are better than others. But lights help to hold off this drop in production if the lights are started early enough. September is the time to stimulate these birds with the rays of the light bulbs. You should be able to keep most flocks laying around 50% until December.

What to do with the flock that drops below 40 or 50% is a question. If held through the molt, there is a period of 2 or 3 months when they do little more than pay their way. If the price of fowl is high enough to pay the cost of raising the pullet, I think it pays to sell them in the late fall.

The flock hatched between Feb. 15 and the end of the summer should lay through the winter without an interruption. Lights are helpful, and feed consumption should be checked often enough to keep tabs on what the flock is eating.

It seems to make but little difference which system of lighting is used. It settles down to a question of which is easiest to work on your plant. A 14 hour day seems to be the best, but there are times when all-night lights are the choice for one reason or another. In the new large pens, now so popular, light sockets are spaced about 14 ft. apart; 60 watt bulbs for short time lighting and 25 watt for all-night seem to work out well.

The hopper requirements for 100 birds are not too definite. About 20 ft. of space seems enough to give maximum feed consumption.

The flock with the beak trimmed close needs special attention. These birds have little inclination to scratch for feed in the litter. They have trouble picking up either grain or pellets from litter or bottom of a feeder. Their feed consumption and their production will be low unless the

feeding is done from well filled hoppers.

Respiratory troubles are the cause of more cases of low production than mistakes in feeding. When these troubles hit, the so-called pampering—wet mash, putting out fresh feed often, running the hand through the feed in the trough, feeding milk, pays off.

The water supply in winter is just about as important as the feed. No matter how cold the weather, they must have their water. A half day without it is more serious than a cut in feed.

Broodiness seldom gives much trouble in egg flocks. But when there are broody birds, the production level is held higher by breaking it up promptly. Best for this is a wire bottom crate with mash feeder and water can. Confine the bird the first night she insists on staying on the nest.

A higher rate of lay is maintained by poultrymen who cull continuously. Usually the birds that develop bad eyes and paralysis can be salvaged in the early stages. Yet there are many wholesale egg producers who figure that it does not pay them to cull. When a pen drops below 50%, they sell the entire pen.

I do not think that housing is a big factor with high production heavy birds. With a top laying strain, we can hold a high rate of lay in a laying shelter even with water near freezing and the pens wet. But the number of dirty eggs and the unpleasant working conditions make us favor a more comfortable building. The important things in getting continuous heavy production are health, high production stock, adequate feed and water.

Don't Force Milker

The operator, not the milking machine, should be speeded up if milking time is to be reduced. E. T. Itschner, University of Missouri dairyman, says many dairymen are setting up the speed of their milkers trying to cut chore time. Itschner warns that a faster operating machine may actually increase milking time. A speeded-up machine may get less milk and there is more chance for injury to the udder.

Itschner says the manufacturer's recommendations are the best guide as to adjustments. Also, check the machine frequently to see that it is in top shape. Neglect of the milker may lose more time than is gained by speeding it up.

—Cappers Farmer

Value of Typed Classifications

Condensed from The Jersey Bulletin

George W. Trimberger
Cornell University

THE first requirement for a good dairy cow is that she possess the ability for high and efficient production year after year for a long lifetime. A herd sire is outstanding only if he has the ability to transmit his half of the inheritance toward producing this particular kind of female for a dairy herd. The accomplishment along this line can be permanently determined only by a continuous testing program for all individuals in the herd year after year, as is the procedure in HIR testing. This is one of the cornerstones to success for breeding and maintaining an outstanding dairy herd.

The correct type of body conformation is essential for high lifetime production. A cow that deviates from this established type may possibly have a few high records but she does not possess the characteristics to stand up year after year for the continuous high production that is so important for efficiency, economy and net profit.

Many of the body characteristics that are stressed for desirable type play an important part in high production. For example, a good dairy cow cannot have much excess flesh on her frame. If she is to function well as a machine for turning roughages and concentrates into milk her middle must have a large capacity to provide the essentials for a workshop and storehouse combined. Likewise, the proper kind of udder is necessary for high production and to withstand the many infections and bruises that all cows are exposed to from time to time.

A breeder derives an important part of his income from the sale of breeding stock. Type and appearance play an important role in establishing a good market and obtaining favorable prices. Purchasers of breeding stock pay additional money for this because they recognize the correlation of correct type with long lifetime production if a cow possesses inherent ability for high production as determined by production testing.

Beyond the above, there is an esthetic value in having beautiful

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animals. Animals of superb type are likely to be nearly perfect in body conformation, and it is a pleasure to own and work with them. There is no substitute for enjoying one's work, and fine animals make the work seem easy. Beautiful animals are often given better care than are animals in herds of nondescript type. Actually this can result in more milk and fat and a greater profit.

For all breeds, the production levels for all classifications drop steadily when Excellent, Very Good, Good Plus, Good, and Fair cows are compared. However, a great deal of this difference is due to the differences between herds. Most breeders aim for superior type as well as high production, and the most successful breeders get both.

A more accurate test to indicate the relationship of type to production is to make the comparison on the intraherd sire. This means that the relationship between type and production is studied among individuals in the same herd. On this basis, the favorable relationship between type and production still holds but it is now considerably lower. For example, the research by W. J. Tyler and George Hyatt at the University of West Virginia, showed that within a herd, the production increased by 13 pounds of butterfat for each increase in type grade. When figures on actual production and classification are available, they usually agree rather closely with this figure. The comparison of production records and classification rating for more than 14,000 Jerseys listed in the Jersey Herd Classification pamphlet agree with this, as is indicated by the following figures:

Classification	No. of Cows	% of Total	305 2x ME Fat
Excellent	801	5.7	483 lbs.
Very Good	4,213	29.8	460 lbs.
Good Plus	6,060	42.8	448 lbs.
Good	2,700	19.1	434 lbs.
Fair	369	2.6	420 lbs.
		100.0	

Although these differences show statistical significance, their practical significance is small. Under no condition can it be suggested that breeding within a herd for higher production can be used as a means to increase type, nor is the reverse of this true.

The ideal is high production combined with outstanding type. Good type does not insure high production, and it is necessary to emphasize both in a breeding program. If a cow is of outstanding type, the breeder is assured that fundamentally the cow has the kind of conformation required for high and long lifetime production. High inherent ability for production and good management are necessary for proper operation of this desirable milk-producing machine.

Scientific studies at the University of West Virginia by W. J. Tyler and George Hyatt have

shown that selection for type through a type classification program should improve the type of future generations of dairy cattle. However, this improvement may not be as rapid or marked as is expected by some breeders. It requires patience, persistence, and full knowledge and control of the factors involved to make gradual progress. In a herd composed of individuals similar for breeding, and with a type average for the herd of Good Plus (82.5), if parents with a Very Good (87.5) type classification are selected, the resulting offspring will average 84.

The above is in line with present information available on type inheritance in a dairy herd. Based on heritability studies, the offspring should inherit or show improvement of about one-third of the observed superiority of the parents' type, as compared with the type of all individuals in a herd.

The overall picture of the herd does give an indication of what can be expected for the genetic composition of the individual. Often this differs from the observed or external appearance. Thus, groups of individuals and all individuals for several generations should be considered in planning a breeding program. This gives the best indication of internal genetic composition which is so important in transmitting ability and approaching purity of breeding.

In practice, herd improvement in the type of dairy cattle can be accomplished by the selection of animals for breeding that are above the herd average in type.

The classification of herd bulls has always been a controversial subject and in writing this article it is recognized that this subject has received a great deal of discussion both pro and con for the various breeds. This has led to the present situation where a great many breeders are confused about the situation. Sound scientific research is very necessary on the information available to give either side enough definite and reliable information to be sure of the stand that they take. At the present time, only opinions prevail, and often they are based on exceptions and are unreliable.

During recent years, the Jersey, Holstein, and Ayrshire breeds have required classification of all bulls in a herd; for Brown Swiss it is optional or within the decision for the breeder to make, and there is no provision at all for classification of Guernsey bulls.

It should be recognized that to a breeder who believes in equal inheritance for type from the sire and the dam, the classification on the sire could give the same information for breeding as from female classification, with the exception of the mammary sys-

tem. Also the type may be modified by the secondary male and female characteristics which are determined by hormone secretions.

Some line of breeding may have outstanding type for both males and females; in others the females may be of outstanding type and the bulls only mediocre; and still other lines may show splendid type for the bulls but only mediocre for the females. If these conditions exist, and there is considerable practical evidence that they do, then the classification of bulls would serve a very useful purpose to point out these conditions to the breeder so he will know what to expect from his breeding program. The type to expect for bulls would be very important to a breeder who sells many high-priced bull calves. In this instance the appearance of the young bulls would greatly influence both the ease of selling and the price obtained. Such breeders could avoid making certain selections based on classification information. A breeder interested chiefly in females would be satisfied with a line of breeding in which the females are of splendid type. For the third condition, where the bulls appear better in type than the females, a careful study of the results from female classification should avoid a pitfall here since every breeder needs good type in the cow herd.

There should be little argument on the fact that good head character, a strong and straight top with a flat rump, deep ribbing for body capacity, smooth shoulder, good legs, dairy refinement and openness of body conformation, and character and refinement, with symmetry and balance throughout in the body conformation, are all inherited from the sire and the dam and can be observed in both. The mammary system or udder, although inherited through both sire and dam must be studied through the sire's daughters, the grandsire's daughters, a sire's dam and granddam, as well as maternal sisters and brothers and their progeny.

To evaluate the transmitting potentialities of an individual through family and group study of all related individuals is much more accurate and will produce much more pleasing results from a breeding program than will individual appraisals. With several generations and many individuals involved, and these often located on a number of farms many miles distant, the only way to get this information is through type classification results. This is why the program is so essential for a breeding program involving type improvement. Many breeders are now using the breakdowns on individual points of conformation very effectively to get sound information in planning a breeding program on type.

In writing favorably about the classification of sires and all of their progeny, it must be recognized that there are many glaring exceptions for correlation between the type of daughters from a sire and his own classification, as well as with cows and their daughters.

An appraisal or estimate of a sire's breeding value for type can be made from a progeny test or from a pedigree study. In either approach the classifications under the subratings, together with the final overall classification, are important and can be used to good advantage in breed and herd improvement, especially in attempting to ascertain weaknesses. The correlation between a sire's own type and the type of his daughters is not well known and additional research is very much needed on this subject. The practical question involved is the usefulness and importance of type classification of a sire in predicting the type of his daughters. No doubt, some breeders overemphasize the importance.

One can find striking examples in which a bull with a high type classification rating, or an outstanding show ring record passed on very desirable type to his offspring, and others in which bulls that were poor in type sired offspring that were also inferior in type. Other breeders under-emphasize the importance of herd sire classification, and cite instances in their experience in which a show ring winner had sired disappointing types, or, on the other hand, a bull of only fair or good type had offspring of remarkable and outstanding type. Still other breeders realize that usually good type follows good type and poor type follows poor type, for both the bull or cow used in a breeding program. They also recognize the possibilities mentioned above, but understand that they are the exceptions rather than the rule and that often the exceptions create more of an impression than do instances that follow the rule. When all information is available, it should be evident that the majority of the sires produce what the breeders expect of them—good offspring from good type and poor ones from poor type.

Frequently the Excellent sire mated with an Excellent dam will not produce excellent progeny. This can be explained in several ways and is what good students of breeding expect. Unless the excellent sire and dam belong to a group that have all Excellent individuals in the pedigree, they are better in their own individuality or type than they are in their genetic makeup or transmitting ability. This is often referred to as mixed breeding and is a recognized possibility by all good breeders since they realize that purity for breeding is seldom ap-

proached. In other cases an individual will classify Excellent only once in a lifetime and that at an older age with "Very Good" and "Good Plus" as a growing animal.

Probably the excellent rating has been overemphasized by many breeders because only a small percentage of individuals receive this high recognition. More emphasis should be placed on the very good and the good plus individuals and on the undesirability of a classification below this. The lower classifications are very likely to indicate one or more glaring weaknesses, which usually are transmitted and thus wreck a breeding program. When one or more decided weaknesses have been bred into a herd, it often takes generations to correct the fault and breed away from it. Prevention, therefore, is a recommended procedure, and classification information can be most helpful in this regard. It often provides recorded information that cannot be obtained in any other way. Finally, to reach the highest pinnacle in breeding for outstanding type, the very good and excellent individuals again are a necessity in a breeding program.

In a sound breeding program the sire's breeding value for type must be as well known and emphasized as the type of the cows selected as parents. It is only by this balance of emphasis between the importance of the sire and the dam that type in an outstanding herd can be stabilized or maintained, and improvement accomplished, in a herd that is not outstanding in type. It has been said that Jersey breeders have been more tolerant of poor legs than is desirable because in a small breed less weight is carried and thus this particular weakness may not be as important or interfere as much in function as with heavier cows. However, if by general agreement the breeders decided to improve this particular characteristic on a breed-wide basis, the information available on classification of legs for bulls would be very useful, and should convey identical information of equal value as obtained from female classification.

Classification in itself can add little to the significant or insignificant achievements of a bull's daughters which is the most important way to evaluate a sire but it does help make the story complete and provides valuable information on a pedigree and especially adds to the complete information available on the type of transmitting ability for his sire and dam.

A program of classification has many advantages over the listing of show ring winnings. This statement is made with a full realization and appreciation of the glamour, prestige and enjoyment

that accompanies a worthy placing at a show. Sometimes the first 10 individuals may all be Excellent in classification with relatively small differences between them. The report of the winnings, however, show 10 place differences and this greatly exaggerates the actual differences. Furthermore, the classification results for a bull, his daughters, and his ancestors contains much more detail on classification of different parts of conformation. This can be very useful in planning a scientific breeding program and in making a special effort to correct certain faults or weaknesses in a herd or family group. Many practical breeders are planning to successfully use the classification ratings on the subpoints to evaluate the possibility of selecting future herd bulls. This often saves considerable expense in travel and time since much of the preliminary work in making a selection can be done at home. The classification of a bull and his daughters fairly well indicates certain desirable traits and weaknesses in evaluating transmitting ability and indicating the advisability of using the bull or his sons in a herd.

Classification of sires, as well as all classification, should not be considered a rabbit's foot for breeding, but it does supply valuable information on the conformation of individuals. When this is used collectively on a group basis, the breeding program is placed on a sound basis.

Ladino Clover

Condensed from Iowa Farm Science

Dr. C. P. Wilsie, Dr. H. D. Hughes and Dr. J. M. Scholl
Iowa State College

LADINO CLOVER, one of the important pasture legumes in the United States, has reached a new high in popularity. Grown successfully from coast to coast, this productive legume is setting new standards for grazing with all kinds of livestock.

Where it can be grown successfully, hog raisers have found that Ladino has produced faster gains than alfalfa at a considerably lower cost. Dairy farmers have discovered that there is nothing better than Ladino throughout the grazing season for holding milk flow at a high level. Beef producers have demonstrated efficient gains at a great saving when Ladino clover made up a high

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proportion of the pasturage.

For poultry pastures, Ladino is excellent. Relatively short in growth, extremely succulent and palatable, Ladino makes a complete ground cover for the range. At the same time, it supplies a good source of protein and vitamins.

Ladino clove is of most value in pasture mixtures. We now have plantings on many of the major soil types throughout Iowa, comparing Ladino with other legumes in grass-legume mixtures for grazing.

Ladino occasionally has winterkilled in Iowa, and it is not productive during hot, dry periods in the summer. But its general vigor, productivity and capacity for spreading make it one of our most outstanding pasture legumes. We believe that it may well be included generally in rotation pasture mixtures and for meadows that will be grazed.

Ladino is a giant form of white clover. Similar in appearance to common white clover, all vegetative parts are much larger. Leaf size and plant height may be two to four times that of ordinary white clover. Plants spread by thick, fleshy creeping stems (stolons) which root at the nodes. A single plant may spread to occupy 10 to 15 square feet in a year of growth under favorable conditions.

Seeds of Ladino can't be distinguished from common white clover seed. In fact, young seedlings must be several weeks old before Ladino can be identified with any certainty. In general, Ladino doesn't bloom as profusely as common white clover.

Introduced in 1891 from the Po Valley in northern Italy, Ladino clover probably was first grown in North Carolina. Experimental trials were conducted with some success, yet it remained relatively unnoticed for nearly 20 years. Then success in production of both forage and seed was reported from Idaho. From 1920 to 1935, the use of Ladino spread rapidly in the irrigated valleys of California and Oregon, as well as in the eastern states near the Atlantic seaboard. Since 1935 its use has increased tremendously in the north-central states—first in states bordering the Great Lakes and later throughout the Corn Belt.

Because of its rather shallow root system, Ladino is best adapted to moist soils. Soils must have a good water-holding capacity or high yields can not be maintained. Light and drouthy soils are entirely unsuitable. Ladino will tolerate wet soils better than alfalfa or red clover, but not as well as alsike clover.

In winterhardiness, Ladino isn't equal to the northern winterhardy alfalfas under Iowa conditions. But it is considered winterhardy in most of the north-central area.

Because of Ladino's ability to reseed itself and to establish new plant parts by the rooting of stolons, stands may survive even though there's considerable winter injury to the old crowns of the original plants.

While Ladino is a true perennial, it seems likely that plants are rather short-lived. Stands may continue by the establishment of new plants by stolons and by reseeding, but the old crown of the original plant may not last more than 2 to 3 years.

Although Ladino will tolerate soils somewhat too acid for success with alfalfa, it responds to lime on highly acid soils. Phosphate fertilizer usually is needed on Iowa soils, and applications of 200 to 400 pounds of 20-percent superphosphate per acre should be profitable. If soils show need for potash, this application might be 200 to 400 pounds of an 0-20-10 fertilizer. On fields unusually low in available phosphorus and potash, it may be advisable to supplement the initial application with annual top dressings of the same fertilizer.

Since the cost of seed is high, certified seed it recommended. There's no better way to be sure that you're getting pure Ladino and not a mixture including some common white clover.

Because of the small seed size, low rates of seeding are recommended. Our recommendation is to add a small quantity—½ to 1 pound per acre—to the seeding mixture you have been using. For example, ½ to 1 pound of Ladino plus 6 pounds of alfalfa and 8 to 10 pounds of bromegrass makes a good mixture. With a mixture of red clover, alsike and timothy, a pound of Ladino should give you a great increase in the productively and palatability of the mixture. Ladino has been grown successfully with reed canarygrass in wet locations, but the canarygrass must be kept short by grazing or clipping.

Ladino is difficult to maintain in a bluegrass sod—birdsfoot trefoil being much superior to other legumes for that purpose. When planted alone, or as the main component of a mixture with one grass, 2 pounds of Ladino per acre should produce a full stand.

Is My Soil Deficient?

Condensed from Land News

Dr. Frank A. Gilbert
Battelle Memorial Institute, Ohio

SOIL, to the layman, is a mixture of fine particles which, with the required amount of heat and moisture, will produce vegetation. Few not engaged in agricultural pursuits give more than a passing thought to this important gift from nature, but even the less observant will note that soils vary considerably. Some are sandy, and some are hard and clayey. Some are light in color, while others are dark brown, or even black. What one can not tell merely by glancing at a soil, or by running it through his fingers, is its fertility or ability to produce nutritious crops. One cannot always tell this, even by the natural luxuriance of the native vegetation, since many species of plants are adapted to poor soils, or soils deficient in certain minerals. We may also add that a few soils are toxic to most plants because of excessive amounts of some element or mineral which is nontoxic, or even of nutritive value, in small amounts. In addition, a few potentially fertile soils are barren, or are covered by a highly specialized type of vegetation because of conditions such as excessive alkalinity, dryness, or poor drainage.

As examples, "broom sedge" and "poverty grass" are characteristic plants of acid, eroded areas in many parts of the East. When such land is fertilized, so that more nutritious grasses may exist, the "poor land" species are soon crowded out. Magnesium is an essential plant nutrient, and yet the so-called "serpentine barrens", occurring in many parts of the world, are toxic to most plants because of a high magnesium content. Sorrel is indicative of acid soil; sagebrush, of alkaline land; scrub oak, of dry barrens; and cypress and white cedar, of swamps. In many cases, such soils are potentially fertile, but require treatment of one or another before they can be made agriculturally productive. A cursory examination of these soils will give but little indication of their future crop possibilities.

Fifteen elements have been proved to be essential to plant growth. A few more are on the "possible" list, but in such cases the amounts needed are so minute

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that traces are invariably present in nutrient solutions, and no actual deficiency has ever been found, naturally or experimentally. It is unwise, at present, to include such elements in lists of plant nutrients.

For convenience in remembering the fifteen essential elements, they may be divided into five groups of three elements each. The bulk of a plant is composed of the three elements obtained from water and the air: carbon, oxygen, and hydrogen. The next three elements, considered in terms of the amounts present, are nitrogen, phosphorus, and potassium, (N. P. and K.). These are frequently called the primary elements, and are the three considered in the purchase of commercial fertilizer. The formula on the fertilizer bag, such as 4-12-4, or 10-6-4, refers to the amounts of these elements, in the order previously given.

The next three elements, calcium, magnesium, and sulfur, are required in somewhat smaller amounts, and are often known as the secondary elements. Calcium is usually applied to the soil separately as limestone. In many cases limestone contains considerable magnesium, in which case it is known as dolomitic limestone. Sulfur is present in the sulfate form in most fertilizer. In the East, especially near cities, large amounts of sulfur accrue in the soil from the air; but in parts of the West this manna is not so plentiful, and the lack of the element has become a limiting crop-production factor in some localities.

The remaining six elements are usually known as trace elements, not because they are unimportant, but because they are required in small or trace amounts. The plant's requirement for iron, manganese, and boron is usually somewhat greater than for the last three essential plant nutrients, copper, zinc, and molybdenum. Deficiencies of one or more of these trace elements in agricultural soils are becoming more frequent.

One point often misunderstood in connection with trace-element deficiencies is that when such a deficiency occurs, it does not always mean that the element is actually lacking in a soil. It may indicate that certain conditions are present which make the element unavailable to the plant. However, so far as the agriculturist is concerned, it amounts to the same thing.

For example, muck soils are nearly always copper deficient, although in some cases the total amount present may be greater than on soils not considered deficient. Muck soils have the capability of holding the copper in an unavailable form.

In some Pacific Coast soils, the

capacity for tying up zinc is so great that orchardists have abandoned soil treatments of the element in favor of zinc sprays, or of driving zinc nails into the trunks and branches of affected trees. In Hawaii, iron sprays are invariably used on pineapple plants, not because there is no iron in the soil, but because the high manganese content makes it unavailable. On the other hand, the effect of excessive iron and too little manganese is similar to that of no manganese at all. High-phosphorus applications to the soil tend to tie up iron and other trace elements. Where the boron or manganese content of a soil is not very great, raising the pH, as by a too liberal use of lime, will make these two trace elements unavailable. Even a drought has been known to cause a temporary boron deficiency.

Thus, it may be seen that the problem of trace-element deficiencies is complicated, and is not one that can be ignored or cast aside. There is no doubt that trace-element deficiencies are increasing, or at least are becoming better recognized. In many places where crops, including fruit, are being grown on what has been considered marginal land, the use of trace elements has raised production, with better quality and increased yields.

The increasing need for trace elements is not difficult to explain. Some soils, mostly of a sandy nature, were low in trace elements when first farmed, partly, at least, because of excessive leaching. The day of deficiency was delayed occasionally by use of manure and animal fertilizers such as guano or fish meal, but in recent years, with an increased use of high-analysis fertilizers containing no trace elements, they were removed in crop production, or leached away faster than they could be replaced. In many cases the fertilizer itself was responsible for the deficiency, as in Aroostook County, Maine, where an iron deficiency appeared on potatoes, not because of a low total iron content of the soil, but because the excessive amount of phosphorus used in increasing potato production made unavailable the iron that was present.

Much new land has been put into use which requires constant trace-element applications to keep it productive. In addition, some farmers have found that trace-element applications have increased their production, even though no apparent deficiencies could be observed in their crops.

Not all plants respond equally to trace-element applications. Some are much more sensitive than others. For example, alfalfa will become boron deficient on land where cereals are not apparently affected. On the other hand, tobacco and barley have been shown to respond better than

most crops to copper applications.

Pecan, tung, and corn are extremely susceptible to zinc deficiency, while legumes generally require much more sulfur than most plants. If such indicator plants grow normally on a soil, there is little possibility that other species less sensitive will be deficient on the same soil.

The scattered, sometimes controversial, literature on trace elements may be confusing to the farmer who wishes to find out for himself just what the status of his land is, with regard to trace elements. In regions with possibilities of extreme deficiency, as muck areas, experiment stations are of considerable help. However, in many localities they can offer little aid, because the problem has not been studied in these places.

A few far-sighted individuals with pioneering instincts have found out for themselves of just what value trace-element applications have been on their farms. They have gone about it in their own manner, and to their own satisfaction. We have heard considerable about some of these demonstrations. We have heard nothing about others.

One progressive farmer determined the amounts of fertilizer ingredients, including trace elements, that would be removed from his farm in the form of milk, livestock, and hay, during a normal year. After bringing his farm to a satisfactory level of fertility, he added that amount plus ten per cent each year thereafter. Needless to say, this productive farm stands out like an oasis among others in the vicinity, although all are in an excellent agricultural region.

One farmer in Virginia consulted the writer about improving his excellent dairy farm, and applied trace-elements to several fields with little, if any, noticeable results. This was not totally unexpected, since manure and other fertilizers with a high trace-element content had been applied liberally to these same fields for many years prior to the experiment.

The sand hills region of the Carolinas is one of principal peach-growing areas in the United States. Meteorological conditions are favorable, and huge applications of fertilizer increase the size of the peaches. However, the trees tend to be short-lived, and the leaves drop earlier than usual. An examination of many of the orchards showed rosetting, and yellowing of the tip leaves.

One large company with orchards at Hamlet, North Carolina, decided to use trace elements on their new orchards. Results were phenomenal. The trees defoliated later in the summer, the tip leaves did not yellow, the trees grew faster, and production

was unusually good.

However, even this was not enough for one grower. He wanted to find out which trace elements were actually responsible for the better growing conditions. In one of his newly planted peach orchards he used trace elements along with regular fertilizer and lime, but in addition to rows with all trace elements, and rows with none, he had rows with one or another of the trace elements missing. Thus, one row would lack only magnesium, one only copper, one only manganese, one only zinc, and one only boron. Treated rows were separated by a row to which only fertilizer and lime were added, the normal procedure in the region.

Here, also, results were phenomenal, and within a year, differences started to show up. The check rows of trees without trace elements grew slowly. The others shot ahead with longer branches and thicker trunks. A final analysis four years later showed that, in this experiment, copper and boron made the greatest difference, but zinc, manganese, and magnesium were of some importance, since no row of trees lacking a trace element grew quite as well or was quite so productive as the "all trace element" rows.

Today, all of the other orchards on the farm receive annual increments of trace elements, the zinc being applied as a spray, and the others in ground applications.

With such overwhelming evidence in favor of trace elements in this region, one would expect the owners of all the orchards in the area to profit from this experiment. However, only a few of the more progressive farmers have done so. One of the others told the writer, "Peaches don't pay so good".

This South Carolina experiment has been cited as an example of how to conduct a test to determine the effectiveness of trace elements on one's farm. It is not necessary to go into such detail unless one wishes. All that is necessary is to lay out several equal-sized plots on soils as uniform as possible. Apply a trace-element mixture to several of the plots and none to the others. Grow the same crop on all plots, and keep careful records of production. If all of the treated plots are more productive than all of the untreated plots, you have evidence that trace elements will add to your farm production. You can be doubly certain by taking records again a second year on these plots without adding additional trace elements.

If you do not want to go to even this trouble, you can add a trace-element mixture anyway. At 50 to 100 pounds per acre, the only thing you can hurt is your pocketbook.

The testing of the soil for trace elements is not so satisfactory as

testing for the major and secondary elements. The amounts of the major and secondary elements in a soil are so much greater than the usual amounts of trace elements that quick, inexpensive analytical methods suitable for the former are quite unsuitable for the latter.

Quick methods have been used for the determination of trace elements, but where the amount in a soil is not high, results by the quick method may indicate an absence of the element, whereas accurate, more expensive chemical or spectrographic methods may show more than enough to supply the plant's needs.

The method of chemical extraction of a trace element from a soil which will simulate the natural degree of extraction of a plant root is also not too satisfactory. Consideration of the extraction method used must be taken into consideration when comparing results of the amounts of available trace elements in the same or in different soils.

The ideal setup from the farmer's point of view would be a place from which he could get a complete soil analysis of all the essential nutritive soil elements at a reasonable cost. The cost could be made reasonable only by means of volume production, since accurate trace-element analyses are expensive.

Many states do not even have facilities for a complete soil analysis, but those that do have not yet been able to offer such a service to the farmer. Some hope to do so, and prefer to keep soil testing on a state basis. Such programs, if carried out, will be helpful to the farmers of those states.

In the meantime, opinion is divided on the advisability of a private concern's doing such work on a volume basis. Some private service is available, but the price as yet is too high for the average farmer, and results, so far as the trace elements are concerned, are not too precise in some cases.

The tendency to include unessential elements in an analysis is to be criticised, also. Not only is this confusing to the farmer, but it serves no useful purpose, and makes the analysis more costly.

A cubic foot of grass silage varies in weight from 18 pounds (wilted) to 22 pounds (green). To determine the amount of grass silage in your feed wagon or cart, multiply its cubic foot capacity by the above factor, depending on how you made the silage.

—Meaty News

Japan's Extension Service

Condensed from Foreign Agriculture

Garritt E. Roelofs
Technical Consultant, OFAR

GREEN bicycles have become the symbol of rural progress in Japan. These are the bicycles of the men and women who are the field agents of Japan's new extension service, set up under United States sponsorship shortly after the war. There are nearly 10,000 of these men and women now, bringing new ideas and methods to the farm families of Japan's 10,500 villages.

The work of this new extension service is widely accepted and appreciated—but extension services have not always been so welcomed in Japan. At the turn of the century the government set up a system of agricultural associations and cooperatives to provide farmers with technical information, but during the 1930's and World War II it used the system as a rural control agency. Agricultural technicians became associated in the minds of farmers with harsh law enforcement and control. With good reason, an early problem of the present extension service was the suspicion with which farmers first viewed the program. That suspicion had to be dispelled; the new organization had to be disassociated from the old. By means of posters and pamphlets, film slides and movies, farmers were made acquainted with the beneficial objectives of the new service. And by equipping agricultural advisers with arm bands, lapel buttons, and the green bicycles, the service clearly identified them as workers under a new concept and under a new system.

Another problem that stemmed from the entirely new service concept of the program was that of terminology. Many of the words used in United States extension circles could not be translated into Japanese. The word "service," for example, when translated means "servitude." The Japanese solved this problem simply, by making the English words a part of their own language. Such terms as "extension service," "home improvement," "farm adviser," "4-H club" are familiar ones today in the Japanese countryside.

A persistent problem was the lack of leaders. Versatility of the

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kind required for competent farm advisers had never been highly prized in Japan and was not developed in the Japanese educational system. Agricultural technicians who could meet the specialized subject matter requirements were available, but few had the broad experience in general farm problems, the sympathetic understanding of farm people, and the skill in human relations and extension methods regarded as indispensable for effective extension work. Besides, demonstration techniques were almost unknown in Japan because of the country's tendency to formalize all instruction.

That these and other problems are being solved is apparent in the success of the challenging, realistic action programs extension workers are carrying on. Much of their effort goes into helping farmers improve their farming methods and their crops. And much is devoted to training farm youth and to an entirely new field in Japan—improving life in the farm home.

Japanese youth have few distractions in their simple village life and respond readily to opportunities to join organizations. After the war when the doctrinaire youth groups had been dissolved, the natural gregariousness of the boys and girls threatened to make them easy prey to subversive influences. Because a defense was needed against such influences and because rural youth training is regarded as basic to a well-planned, long-range extension program, the extension service organized clubs for farm boys and girls. There are now 16,500 clubs with more than half a million members. Constant emphasis has been given to voluntary organization and membership, the democratic character and conduct of the clubs, and the applicability of their activities to local needs and situations. It is the hope that these boys and girls will be the local farm leaders of the future.

In rural home improvement, Japan's extension workers have one of their most challenging problems. Japanese farm homes are essentially primitive. The kitchen is usually a dark, gloomy, unsanitary place. Knowledge of food values and hygienic preparation is absent or limited. Water is usually drawn from open wells contaminated by surface seepage. Toilets are unsanitary. Vermin are rampant. In trying to better this situation, the new extension service encountered its most difficult promotional problem. Farmers, eager enough to improve farming techniques and increase food production, were uninformed on and indifferent to the need for home improvement and in many instances inhibited by the pressure of ancient superstitions and habits. Women usually pleaded that they

were too busy with field work to do much home improving. Clearly, the first step toward acceptance of the program was to convince the men that it pays off in improved health, happiness, and working efficiency. In order not to frighten farmers away from home improvement work, simple and practical projects within their capacity and means were recommended—arrangement of kitchen facilities, fuel economy, sanitation, home lighting, and food storage. Though significant advances have been made, home improvement in Japan is likely to lag behind other phases of agricultural extension for some time to come.

What of the future of the new agricultural extension service in Japan?

It would be complacent to think that the Japanese will carry the agrarian reforms forward without changes as they regain independence. There is reason to believe, however, that, because so many leaders are genuinely committed to the reforms and so many people beneficially affected by them, complete reversion to the old will not be tolerated.

Hormones Lower Beef Costs

Condensed from Capper's Farmer

George A. Montgomery

Bull calves owned by J. V. Williams, Concho county, Texas, made daily gains of 2.83 pounds apiece in a 139-day test at Balmorhea, Texas, last winter on a ration that was 71½ per cent roughage, 28½ per cent concentrates. Daily feed intake a bull was 18.17 pounds of ground hegari bundles, 3 pounds of alfalfa hay, 1.45 pounds cottonseed hulls and 2.65 pounds cottonseed meal.

The bundle feed was 75 per cent roughage, 25 per cent grain. Most corn belt feeders would be pleased if they could get such gains from big steers on a ration in which shelled corn replaced the hegari bundles pound for pound.

Young bulls in a similar test at Texas Experiment Station's Bluebonnet Farm ate a ration that was 42½ per cent grain and protein meal, but they outgained steers that got 65 percent concentrates. Gains were 2.3 pounds daily for bulls, 2.2 pounds for steers. The 10 fastest gaining bulls put on 2.64 pounds apiece daily and the 10 top steers 2.45 pounds.

The Range Livestock Experi-

Reprinted by permission from Capper's Farmer, Topeka, Kansas, January 1952

ment station at Miles City, Montana, feeds out promising young bulls from the station's purebred Hereford herd. Later, steers sired by the best of these bulls, are fattened. The steers get a ration richer in concentrates, but bull calves generally make higher gains.

While work at Miles City, Balmorhea and other stations had indicated that bulls would outgain steers, the evidence wasn't conclusive. Rations and length of feeding periods were not comparable. Moreover, bulls in the tests may have been higher in quality than steers. The late Paul Gerlaugh, Ohio Experiment Station, decided to compare gains when steers and bulls, similar in age and breeding, were fed the same ration.

He picked calves from a good Hereford herd. Ten were castrated when they were a few days to a few weeks old; 10 more 5 months later. The others were fed out as bulls.

Both lots of steers made average gains of 2 pounds a day. The bulls gained 2.23 pounds apiece daily. They outstripped the steers 62 pounds apiece during the 252-day feeding period, or approximately 12 per cent. Cost of gains was $14.97 a hundred for bulls; $16.22 for steers. The last 56 days of the trial, which ended when the calves were 14 to 16 months old, the bulls outgained the steers 10 pounds apiece. The test will be repeated.

Why do bulls make faster, more efficient gains than steers, and how can the cattleman take advantage of their ability to do so?

Men who have studied the effect of glandular secretions say the male sex hormone is responsible. It causes bulls to become larger and more rugged than steers, rams to become bigger and more vigorous than wethers. Increased size calls for faster growth. And any feeder knows that fast growth and efficiency go hand in hand. The bull develops larger muscles, and that results in a meatier carcass.

When the Ohio test cattle were slaughtered under direction of L. E. Kunkle, Ohio State University meats man, he found 77.7 per cent of bull carcasses and 73.9 per cent of steer caracasses were edible meat. The bulls dressed out 26.4 pounds heavier than the steers, but edible beef averaged 46.8 pounds more. Nine bulls produced 36½ pounds more steaks and roasts than 10 steers. Beef from bulls was only slightly less tender than that from steers, and Kunkle writes that it was highly acceptable after 15 days of aging.

Even though this and other tests may prove that young bulls are efficient meat makers, the well-fed steer seems unlikely to lose prestige as a producer of quality beef. Many cattlemen, however, may be

able to profit by the information developed. On some farms and ranches it may be practical to delay castration until calves reach sexual maturity. That would permit the sex hormones to give animals the normal spurt in growth and muscular development. It is another way to harness natural forces and make them serve man.

There is good reason to believe the effect of the male hormone might carry over for a considerable period after castration. Bits of evidence can be found that so-called staggy steers outgain those castrated early. The fastest gainer in a pasture test in Missouri 2 years ago was a stag. His growthiness could have come from late castration.

Several years ago I visited a veteran Dakota feeder. In his lots were more than 50 stags. He bought thin-necked bulls, 2 years old or younger, with enough quality to justify feeding them several months. Soon after they reached the farm they were dehorned. Heads were pointed up into good muley shape. When recovery from dehorning was well underway the bulls were castrated.

"These fellows make gains that steers can't match," this stockman told me. "I feed the better ones 7 months or longer. As the time passes, the neck thins somewhat. The animal grows, but his neck doesn't. I clip long hair from bellies, heads and necks a month before I sell. At least 80 per cent of these cattle shape up so nobody spots them as stags."

The female hormone also serves a useful purpose in promoting growth. Both Indiana and Nebraska stations have shown that spayed heifers do not make as rapid gains as those that are not spayed. Indiana tests reveal that stilbestrol, a female-like hormone, will speed gains of normal heifers, steers and lambs. In 2 Purdue tests, normal heifers gained 10 per cent faster than spayed heifers. And stilbestrol-treated heifers gained 14 per cent faster than those not treated. To get 100 pounds of gain the normal animals needed 7 per cent less grain and 7.8 per cent less roughage than spayed heifers. But they required 8 percent more concentrates and 9.8 per cent more roughage than those treated with stilbestrol. The male hormone, testosterone, was of no benefit to heifers or steers, but it speeded gains of both in Oregon tests, and cut feed requirements materially.

Indiana steers injected with 120 milligrams of stilbestrol gained 64 pounds apiece more in 140 days than untreated steers and needed 85 pounds less concentrates for each 100 pounds of gain. They gained 18 percent faster than untreated steers. Gains averaged more than 3 pounds a day. Steers that got half as much stilbestrol gained 2.9 pounds daily,

as did those which got dienestrol, another hormone. All hormones, however, lowered on-foot grade of cattle.

Use of synthetic hormones has not been approved by the Food and Drug Administration for meat animals other than poultry treated in a specified manner. However there is no prohibition against hormones provided by nature.

In Purdue tests, gains of wether lambs were stepped up 20 percent by testosterone and 41 per cent by stilbestrol, with big savings in feed. Testerone raised carcass grade, but stilbestrol lowered it.

Manure—Top Soil Builder

Condensed from the Utah Farmer

DESPITE all recent developments in the use of commercial fertilizers and soil-building crops, manure still is the first and most logical way for farmers with livestock to keep their fields fertile and productive.

Correctly used, manure adds many things to the soil which cannot easily be obtained in any other way. In addition to nitrogen and potassium, manure supplies large amounts of organic matter which builds up texture and quality of the soil.

And manure also adds bacteria, digestive secretions, hormones and some of the valuable minor minerals.

Fertilizers alone have only a "shot-in-the-arm" effect. It is recognized that good management requires crop rotations, use of crop residues, and other practices in connection with commercial fertilizer.

Handled so as to get the most benefit, manure does all these things at once, and in the cheapest possible way. Frequently manure must be supplemented with commercial fertilizers, but the manure comes first.

As a fertilizer, manure has two weaknesses—it is comparatively low in phosphorus (except poultry manure) and it is perishable, losing 50 per cent of its value through improper and careless methods of handling. On too many farms this is pure waste because it is easily preventable. Steaming manure piles are a sure sign that plant food is being irrevocably lost.

A cow will produce approximately 10 spreader loads of manure a year with a nutritional value (fresh manure) equal to about $30 worth of commercial fertilizer. If you have 20 head it can mean a cash saving in ferti-

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Salt Lake City, Utah, November 1951

lizer costs of up to $600, depending on how efficiently you handle the manure.

The term "manure" is usually applied to the mixture of litter and animal excrements. In addition to serving as bedding for keeping the stock clean and comfortable, the litter absorbs the liquids and has the ability to stabilize both ammonia and potash so as to retard their loss by leaching.

The greatest single nutritional loss usually experienced with manure is in the liquid portion, which composes 80 per cent of the excrement, and which contains most of the readily available ammonia and nitrogen. In fact the liquid portion contains about one-half the total fertilizing value of manure. The chief cause of this loss of liquid is lack of sufficient litter.

The standard weight ratio of straw to excrement for properly handling all free liquid is one to four, or 500 pounds of litter to each ton of excrement. And the saving in liquid manure fully warrants the litter investment.

The perishable characteristic of manure can be further overcome by the use of superphosphate. As soon as manure is released to the atmosphere, the nitrogen begins to escape in the form of ammonia gas. It is this valuable nutrient that superphosphate acts upon and locks chemically so that the formation of gas is arrested. After the manure is spread on the field the nitrogen and phosphate are slowly released into the soil. Furthermore, phosphating the manure corrects its low phosphorus content.

On a 36-year test made by the Ohio experiment station, ground fed with stall manure plus 32 pounds of superphosphate per ton produced an average increase per acre of nine bushels of corn, six of wheat, and 840 bushels of clover hay more than was obtained on ground fed with stall manure alone.

Should you use fresh manure or let it rot? The somewhat traditional view that rotting adds value to manure is held by many farmers. It is common practice to make comparisons between fresh and rotted manure on a ton-for-ton basis. This comparison does not take into consideration the fact that it takes two tons of fresh manure to make one ton of rotted manure. Thus, one ton of rotted manure may be more concentrated and have a higher nutritional value—but it will not equal the nutritional value of the two tons of fresh manure from which it is made.

Of even greater importance, the rotted manure represents a 55 per cent loss of original organic matter—the lasting soil-building factor of manure. The following table, based upon a test described in Bulletin No. 605 of the Ohio

state experiment station, clearly shows the losses which occur in mixed horse and cow manure after three months of storage in a tight-floored shed. After three months, the manure was described as "thoroughly rotted."

Composition of Fresh and Rotted Manure

Composition	One ton of fresh manure	After rotting	Loss through rotting
Total weight	2000 lbs.	745 lbs.	63%
Organic Matter	485 lbs.	220 lbs.	55%
Total Nitrogen	12.3 lbs.	9.9 lbs.	20%
Readily available nitrogen	1.65 lbs.	.04 lbs.	76%
Total phosphoric acid	6.2 lbs.	6.2 lbs.	None
Readily available phosphoric acid	3.8 lbs.	5.0 lbs.	32% Gain
Potash	15.3 lbs.	15.3 lbs.	None
Carbon-nitrogen	16.1 lbs.	9.1 lbs.	44%

The modern large-capacity, rubber-tired manure spreader drawn and operated by tractor power makes daily spreading of manure practical. Those spreaders with small diameter tires are especially low-slung and easy to load and maneuver.

Contrary to prevalent thought on the matter, very little waste occurs in the field from daily spreading. This is especially true where the spreader mechanism is driven direct from tractor power take-off with the result that the manure is more finely shredded and uniformly distributed.

You need not fear leaching, in the field, of properly prepared and spread manure. Such leaching is very slow and passes directly into the ground where it is held until needed. This leaching is entirely different from that which occasions such large losses of nutrients from manure stored in piles in the open. The capacity of the soil to absorb nutrients leached by rainfall from scattered manure is several times greater than the quantity contained in the manure.

Numerous scientific tests have shown that it is more profitable to spread manure lightly and over a greater area each year. This is because productivity results do not increase in proportion to increased rates of application. So as a general rule, with a limited quantity of manure and a set number of acres, the crop returns from the total acreage will be considerably greater if the manure is spread equally over the full acreage than if the manure is spread twice as thick and only half the acreage is covered.

Good proof of this rule is found in tests made by the Ohio State University agricultural extension service on a three-year rotation of tobacco, wheat and clover. On one the manure was spread at the rate of 20 tons per acre, and on the other 10 tons per acre. The lighter application gave a 40 per cent greater crop dollar return per ton of manure used. Another substantiating test was run by the Pennsylvania experiment station on a corn crop. Six tons of manure an acre produced 56.3 bushels of corn.

Cooperative Livestock Auctions

Condensed from New England Homestead

Eugene O. Brielman, D.V.M.

THIS article is not written with an idea of discouraging cooperative auctions, as I believe they are a good institution if properly conducted.

What I want to do is to stress some of the dangers that may be encountered in the purchase of animals from these sales. These auctions do not require health charts or any recognized professional examination of the animals offered for sale. Therefore animals of questionable health status may be brought in.

These auctions were intended principally for sale of animals for slaughter, as farmers realized that they often could get more by this means than when obliged to sell to the local dealer. They have gotten away from this practice to a marked extent and today people are buying animals offered for sale with the idea of keeping them. In this practice lies the danger. As these auctions do not require health charts from the proper state authorities, a person may send an animal to the auction that may have a contagious disease such as Bangs, tuberculosis, mastitis of cattle, hog cholera, and hemorrhagic septicemia of hogs. If these diseases are not in the advanced stages, animals could easily be put through the auction sales and sold to an innocent buyer.

A person buying an animal of this type might easily carry the disease home to his herd and therein is great danger. Under present State and Federal regulations it is unlawful to bring cattle across state lines without having the proper health certificates and permits signed by the state officials. Heavy penalties apply. Yet at present people go to these auctions and purchase animals and bring them across the state lines and nothing is being done to prevent it.

Of what value can a state wide disease control program such as we have for tuberculosis and Bangs and various other diseases be when dealers and purchasers can buy and transport these animals of doubtful health status into the various states, and by this means defeat the very object of our disease control program. These violations, I believe, are more numerous when auctions are

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conducted near state lines. Persons buying animals without the proper health certificate and introducing them into their herds risk not only the possibility of causing a serious outbreak in their present healthy herd, but also of losing their herd accreditations.

It is the duty of our state live stock officials to correct this practice and see to it that the laws affecting the sale and transporting of these animals are enforced. Our state police can also be of great help in demanding health charts and permits from people transporting cattle on the highways. As a last resort it might be necessary to call in the Federal Department to enforce interstate shipping regulations.

Another practice that must be discouraged is the bringing to auctions of animals that are known to be sick or have been under treatment for various diseases. Rather than take the financial loss that might result from death, animals are often taken to the auctions and sold to butchers, etc., and the meat becomes a health menace. This is where our department of Public Health can come into the picture.

The warning that I want to bring out most strongly is to the persons who go to the auctions with the idea of buying replacements. An auction where the properly certified health charts do not accompany the animals is no place to buy to replenish your stock. You may bring home diseases that will cause great losses as well as infect your premises.

Don't buy calves to raise as replacements unless you are very sure of their health status. They may look all right at time of sale when they are brought in and are excited, but you may bring home white scours, which is a deadly calf disease, and if it once infects your premises is may be there a long while and cause great losses in your subsequent calf crop.

At present a farmer may send a cow or heifer that has recently aborted. Said animal may look well, but could be harboring the dreaded Bangs disease and infect many of your animals in a short time. This disease can only be detected by a proper blood test made by a reliable laboratory or veterinarian.

Mastitis, the disease that causes enormous losses every year, is another one to be on your guard against. It is easily recognized in the acute stages when the quarters are badly swollen and changes are taking place in the milk, but is not so simply detected in the chronic stages or when a cow is dry. A mastitis quarter could easily infect your milking machine or other equipment and cause severe troubles in your herd. Many mastitis cows are offered at these auctions and the only safe place for them is the slaughter house.

Dealers commonly send these chronic mastitis cows to auctions when dry or while they are springing bag, as at this stage they look good and it is difficult to detect the condition.

Be careful of your hog purchases, also, so as not to get an animal with hog cholera or hemorrhagic septicemia. If you get one with these diseases you will soon realize it by having a very sick hog and probably infecting the rest of your pigs if you have any. They don't live long with these diseases.

Nutrition During Gestation

Condensed from Nutrition News Bulletin

MANY farmers and livestock men believe that if a ration supports life and reproduction, it is adequate for optimum performance. They never realize that there may be many borderline deficiencies in the ration, no single one of which is obvious, but the combination of all are keeping production and reproduction much below the capacity of the animals when adequately fed in all repects.

"Most malnutrition met in practice is only sufficient to cause minor clinical manifestations but is sufficiently advanced to materially affect the health, rate of growth, and reproduction of the affected animal." That statement is more true today than when originally made in the North American Veterinarian, December, 1937.

Too few realize and appreciate what a terrific loss the cattle producers of the nation are suffering each year because of skip or idle cows, cows that lose their calves and cows whose calves survive but never grow and develop at a normal rate. The importance of shy breeding, delayed calving and culled cows in our dairy herds is often called to our attention. Considerable research has been done to determine some of the causes of these troubles. Less often are we reminded of the loss in our beef herds and flocks of sheep.

The following will illustrate the difference between average performance of today and achievements in dairy herds under good feeding and management:

Even though much yet remains to be learned, research and practical experience point the way to management and feeding practices that can significantly improve results in most herds and flocks today. The practicing veterinarian

Reprinted by permission from Nutrition News Bulletin, St. Louis, Missouri, January 1952

The Average Dairyman

1. Loses from 15% to 25% of his dairy heifers.
2. Not less than 25% of those grown out are liabilities.
3. They average 28 to 30 months of age and from 50 to 100 pounds underweight at first freshening.
4. Lets his dry cows lose condition.
5. Tolerates a 15 month calving interval.
6. Lets the average cow be idle 50% of her entire life from birth to market.
7. Has to cull 98% of his cows before old age.
8. As a result is increasing milk production in herd only 16 pounds per cow per year.

Actual results of a large herd of grade cows that for more than two decades has been on a good feeding and disease control program.

1. Less than 3% heifer mortality.
2. First calf heifers averaging 397 pounds fat first lactation (305 days).
3. First calf heifers averaging 150 pounds above standard weight at first freshening at 24 months of age.
4. Dry cow gaining an average of 125 pounds in the 60 days dry period.
5. Calving intervals averaging 12.5 months.
6. Cows idle less than 40% of their lives from birth to market.
7. Old cows showing little decline in production even up to 12 years of age.
8. Milk production increased more than 15 times faster than national average (16 pounds per cow per year) for 23 years.

can often, in addition to his service of disease and parasite control, render a service to the herd owner by recommending proven practices of good management and improved feeding, even though research has not yet secured all the answers explaining why these practices improve results.

Dr. G. W. Salisbury, Head of the Department of Dairy Science of the University of Illinois very ably discussed "The Relation of

Management and Feeding to Reproduction Difficulties in the Dairy Cow" at the St. Louis Conference for veterinarians, sponsored by the Ralston Purina Company, last September. Dr. Salisbury pointed out that a survey in the state of New York shows that about half of the breeding difficulties in dairy herds of that state are of disease origin and about half are due to failures in feeding and management practices.

In spite of the fact that the energy intake of cattle is a most important nutritive need, Dr. Salisbury feels that consideration of the effect of overall lack of food is seldom emphasized from the standpoint of its effect on reproduction. In this connection he stated that it is well to remember that in studies with laboratory animals, it has been shown that energy deprivation has profound effect on the reproduction capacity of these animals.

Partial starvation is seldom uncomplicated by lack of other nutrients. In the same fashion lack of other essential nutrients in the diet often leads to reduced total intake of feed and a consequent effect on the energy intake.

Dr. Salisbury's report and research work of others help to explain some of the results which have been secured through field research and observations in general practice throughout the country.

Asdell has concluded from his studies of young animals of reproducing age that reproduction is a luxury, so to speak. In other words, we do not secure optimum reproduction from our animals unless their other requirements for nutrients are first adequately met. The older the animals become, the more resistant they become to nutritional deficiencies as they affect reproduction, but even undernourished old cows perform very poorly. They often show irregular heat periods and in extreme cases, a cessation of oestrus and low fertility. This is constantly being demonstrated in herds and flocks throughout the nation. These statements become especially impressive in light of the fact that in some sections of the United States the annual calf crop among our beef herds averages less than 60%, while in most cases the statewide average will be less than 80%. In some well-fed and well managed herds, the annual calf crop will average 95% and better.

It is easier to appreciate the terrific loss that the ranchman and the nation are suffering because of poor feeding and management with the cow herds, when we realize that reproduction failures in beef cows alone is costing our nation more than 20,000,000 pounds of beef annually.

It is reasonable to assume that poor calving records among our

beef herds is due more to under nutrition and less to disease factors than is the case among our dairy herds, thus making better nutrition relatively more important.

Many authorities are convinced that protein deprivation of range cattle, especially during drought periods, is a principle cause of breeding troubles, but the importance of the protein portion of the ration is often complicated by the lack of total feed intake.

Palmer and associates at the Minnesota Station have shown the importance of protein and phosphorus in proper development and sexual maturity of the growing heifer. Lack of minerals in addition to phosphorus also are sometimes contributing factors. The spread between what the average beef cow herd is now doing and what they are capable of doing is impressive.

The following are some actual results from range work in different sections of the United States.

Supplemental Feeding of Range Cattle, Agricultural Experiment Station, University of California, "In 1937–38, 82% of the cows which received supplemented diets became pregnant as compared with 76% among the unsupplemented ones. During this same period, 48% of the cows fed on unsupplemented diets had to be treated for retained placentas and some death losses occurred."

In the fall of 1947, west Texas was experiencing extreme drought conditions. Some ranchmen were forced to abandon their ranches, others retained their cow herds through supplemental feeding. Experimental projects were set up under these extreme conditions to compare the values of different types of supplemental feeding to these range cows under these extreme conditions.

On one ranch 98 good, but thin, undernourished cows were divided uniformly between 2 lots of 49 head of cows in each lot. Each lot of 49 cows was suckling 34 calves. In December of 1947 when these cows and calves were divided uniformly between the 2 lots, one lot was placed on an unfortified single source of protein (43%). The other lot received a mixed protein supplement fortified with minerals and vitamins. The 2 lots of cows were continued on equal but poor range pastures. They were fed exactly the same amounts of the respective supplements day by day. Bulls of the same quality were turned in with both lots of cows on the same date and removed from the lots on the same date. It will be recalled that when the test was started, each lot of cows had 34 calves or 69% calf crop on the ground. Twelve months later the cows receiving the unfortified supplement had 39% calf crop on the ground and the other lot receiving the fortified

supplement in exactly the same amounts had 59% calf crop on the ground.

The calves from the fortified supplemental lot were dropped earlier. They were much more thrifty, grew faster, their mothers looked better and were in much better flesh and condition. Of course, neither of these calf crops was satisfactory, but under the extreme drought conditions that were experienced the Lot 2 cows receiving the fortified supplement did an outstanding job.

At the same time this project was started, another comparable ranch, with similar conditions was subjected to the same comparisons. In this case, 88 cows were uniformly divided between 2 lots and fed and handled in exactly the same manner as those previously described. At the end of 12 months after the project was started the 44 cows in Lot 1 receiving the unfortified supplement had 10.61% fewer calves on the ground than they had 12 months previous, while the Lot 2 cows receiving the fortified supplement had 17.27% more calves on the ground than they had 12 months earlier. In this case, too, the cows not only produced more calves as a result of better nutrition but they were in better condition, looked better, dropped their calves earlier and the calves themselves were more thrifty and grew at a much more rapid rate.

In 1949, another similar project was set up in Florida, involving a total of 800 cows and their calves. This project also was set up under extreme conditions to further test the value of fortification of the supplement fed to beef cows under poor range conditions. The 1950 calf crop as compared with the 1949 showed that the cows receiving the unfortified protein supplement dropped 3.88% more calves in 1950 than they had dropped in 1949. While the other 3 lots of cows each receiving mixed proteins fortified with minerals and vitamins showed an increase of from 41½% to 70½% in calf crops in 1950 over 1949. As in the cases reported in west Texas, the cows looked better, they were in better condition, the calves were more thrifty, and grew at a more rapid rate than those in the lots receiving the unfortified supplement. These results and others show the importance of proper nutrition of the cow during the gestation period if maximum rate of reproduction is desired.

The same principle applies to breeding ewes. In 1936, 5,400 breeding ewes were divided uniformly among 3 lots to study the effect of single source of protein supplement unfortified as compared to a variety of protein fortified for range ewes during the winter feeding period. Everything was as uniform as practical among these 3 lots of

1,800 ewes each at all times, excepting the actual composition of the supplements fed in the different lots. The ewe flocks were rotated among the different ranges so that the range conditions were equalized. 90.48% of the ewes receiving the unfortified supplement dropped lambs, while 93.35% of those fed the fortified supplements dropped lambs. The lot receiving the unfortified supplement dropped a 93.99% lamb crop while the duplicate lots on the fortified supplement averaged a 96.36% lamb crop.

Besides this increase in lamb crop and the per cent of ewes that lambed due to improved nutrition, there were fewer mortalities and fewer culls from the flocks receiving the fortified supplement than from the flocks receiving the unfortified supplement. There was also an increase in fleece weights as a result of feeding the more complete and fortified supplements.

Bulletin No. 399 issued in February, 1950 by the South Dakota Station shows the importance of liberal feeding during the gestation period.

Inadequate nutrition is causing enormous losses in reproduction in cattle herds and sheep flocks.

Research has established enough facts to significantly increase the national calf and lamb crop—if proven practices are adopted by producers.

New Soil Conditioner

Condensed from Missouri Ruralist

M. N. Beeler

A NEW soil conditioner will be on the market sometime in 1953. It is a chemical called Krilium which is applied like fertilizer.

The Monsanto Chemical Company, developer of the compound, says it is 100 to 1000 times more effective in improving soil structure than manures, compost, peat moss or crop residues. Altho Krilium (rhymes with trillium) is not a fertilizer, its action in improving soil structure apparently makes plant foods more readily available and so increases yields.

The new product was announced December 29, 1951, by Charles Allen Thomas, St. Louis, president of Monsanto, at the an-

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nual meeting of the American Association for the Advancement of Science, in Philadelphia.

Up to now, only pilot tests of Krilium have been made. But the experiments have been conducted under varying conditions and on various soils thruout the United States by about 80 scientists. From their reports, Dr. C. A. Hochwalt, Monsanto vice-president and director of research, concludes:

"Krilium is expected to have wide application as a soil conditioner for home gardens, truck farms and greenhouses. It also may be useful in commercial agriculture."

Here are some of the advantages observed from adding the chemical to soil:

Improved structure—The ideal structure for well-conditioned soils is made up of crumbs or granules the size of a pinhead to a pea. Such structure exists in virgin soil containing much decayed vegetable matter. It can be had in worn soils, particularly clays and silts, by adding organic matter. But such vast quantities are required for the ideal condition that the process is long and expensive.

Monsanto says Krilium will substitute for organic matter in this purpose. The right treatment will cement the particles into granules of desirable size which resist both slaking by water and decomposition by soil organisms. Action is speedy. Formation of clay aggregates or granules is readily noticeable within 24 hours. The soil mass becomes porous and friable with small spongy balls.

How long the treatment will last, nobody knows. But in speeded-up laboratory tests the structure induced by treatment has stood up 30 times as long as that obtained by applying commercial composts. No deterioration of greenhouse and field plots has been noted in three years. But tilth can be destroyed by compacting and overworking.

Better moisture intake—A porous, spongy structure means more rapid and greater water intake. Since the granular surface does not seal, water does not run off so readily.

More water storage—A loose, open structure provides more storage space for water in the plow zone and provides more rapid percolation into subsoil and so more storage there. Krilium-treated soil has improved water infiltration as much as 300 per cent.

Better aeration—Despite greater water holding capacity, the treated soil is well aerated, because of the spongy condition. Altho it drains freely (downward by gravity) the soil retains as much as 30 per cent more moisture after saturation and drainage.

The extra pore space provides easy entry for oxygen which is

necessary for plant roots to feed well. Thus more of the nutrients in soil, whether added or naturally present, become available to crops. Also improved aeration encourages desirable soil organisms, and there's some indication it may discourage some soil-borne diseases such as damping-off and root rot.

Less evaporation—the granular plow zone serves as a mulch against losses by evaporation from the subsoil. Monsanto says in some tests, a treated soil took twice as long to lose half its moisture as an untreated soil of the same type.

Better seed emergence—Since crusting after rains is retarded or eliminated, seedlings have a better chance to come up to a good stand. Crusting is often fatal to sprouting seeds of such crops as clovers, alfalfa, soybeans, beans, peas, cotton, sugar beets and even corn.

Easier tillage—Treated soil is more workable, offers less resistance to implements and so requires less power and labor in tillage and cultivation. Further, the soil can be worked at higher moisture content without causing puddling when it dries. Monsanto reports that 45 parts water added to 100 parts of Paulding clay made a muddy "soup." But when 0.1 per cent of Krilium has been added to the same type of soil, the same amount of water produces a moist, crumbly, easily-worked mass of small aggregates.

Bigger yields—Altho Krilium is not a plant food, all the foregoing improvements it works on soil add up to better yields. Limited field plot tests with treated heavy clay and treated sandy soil gave the following average yield increases: Potatoes, about 45 per cent; radishes, 15 per cent; corn, 20 per cent; Chinese cabbage, 20 per cent. In individual cases radishes and carrots gave 30 to 100 per cent increases, and corn 50 per cent. But Monsanto warns these tests are so limited no definite conclusions should be drawn. No claim is made that Krilium will increase all yields under all conditions.

Also remember that to date no results from larger field trials are available. Monsanto seems to think that experimenting up to now indicates the new chemical probably will be useful for conditioning home garden, truck farm and greenhouse soils.

What application can be made in farming operations is anybody's guess. It all depends on what large-scale conditioning with Krilium will cost and the benefits that will come from the investment. But a little speculation may be justified.

If the new chemical pans out it might help speed restoration of a lot of worn-out land. The greater water holding capacity might tide crops on good land over the recurrent dry spells in the humid

and semi-arid regions. Particularly it might make nitrogen more effective at earing and tasseling stages for corn. Treatment might substitute for the organic matter which the plains country never had in desirable quantity. The granular plow zone condition might slow or prevent wind erosion and dust storms. It could possibly result in more moisture storage and retention to insure or increase crop yields.

It might speed re-establishment of range grasses. In irrigated areas the preliminary production of plow-down crops to add organic matter might be bypassed. Then once the soil condition is established, less irrigation water might be necessary because more of that applied to the land would be used by crops. Deposits of alkali and other water soluble salts by evaporation might be slowed. Or maybe conditioning might help wash the accumulations out of already damaged surface soil.

Even if field treatment proves impractical, maybe row treatment won't be. Lister furrows or even surface planted rows that won't crust help out.

Krilium seems to have possibilities. But time, not speculation, will prove its value in farm operations.

Livestock Bruises Cost Money

Condensed from Better Farming Methods

Walter J. Wills
University of Illinois

In 1949, 73,361 animals that would have produced over 14,000,000 pounds of meat worth $4.4 million were dead upon arrival at market. Another 128,000 animals were crippled, with a loss of meat estimated at over 7,500,000 pounds worth $2.3 million.

These two losses represent a lot of money, but a farmer can be provided protection within limits from the loss by transit insurance. The insurance rates vary, depending upon markets and species. Rates on a given market for a given species increases as distance increases. Loss experience of the insurance company is a factor in insurance rates. The lower the losses the lower the rates.

In some areas if a particular trucker has unduly high losses his rate may be higher than the

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regular rate. Therefore, a farmer should check to see if his trucker's rate is higher than the prescribed rate and determine why. A shipper should also determine if the insurance rate is included in the trucking rate or is in addition to the trucking rate.

Bruises are an even more important source of loss. In 1949, 31,790,000 pounds of meat were lost from this source at an estimated value of over $25,000,000. This loss frequently cannot be seen when the packer buys the livestock, so he must buy on the basis of average losses. Therefore, the farmer who has no bruises pays for the total losses by a lower price for his livestock.

In a study in 1948 one packer found 39 percent of the cattle bruised. An analysis of causes showed 62 percent crowding, bumping, and rushing, 18 percent trampling, 9 percent clubs, and 5 percent horns. These losses could have been kept down by careful loading, loading only what the vehicle could safely carry, good bedding, and things of this nature.

Another source estimated losses from horn injuries in 1948 at $7.8 million. Frequently buyers discount horned cattle 25 cents a hundred or $50–$60 a car. In this study on cattle bruises there was a wide variation between markets. At one market where the cattle were hauled 900 miles or over the loss was $7.85 a head, at another market with the cattle coming 100–200 miles the loss was $1.14 a head. Losses from bruises were greater for cows than for other classes of cattle.

This bruise loss amounted to $2.04 a head on all cattle in the study or $5.22 a head on the cattle bruised. Loss from bruise is due to two factors: (1) The amount of meat that cannot be used for human consumption (31 percent); and (2) downgrading of the carcass or wholesale cuts (69 percent).

In a study of hogs, 36 percent were bruised. The ham is usually one of the most valuable cuts and 48 percent of the cuts bruised were hams. Of these bruises 60 percent were caused by clubs or other devices to drive hogs, 17 percent from crowding, and 11 percent from nails or other sharp objects. Nearly half these bruises could be traced back to the farm as the place of origin.

The loss amounted to 15 cents per hog in the study or 42 cents per hog bruised. The loss on 200–250 pound hogs was about half the loss on 300–350 pound hogs. The figures indicate extensive losses can be reduced by carefully following recommended procedures for shipping livestock.

These Points Reduce Bruises

1. Dehorn cattle, preferably when young.
2. Remove projecting nails,

splinters, and broken boards in feed racks and fences.

3. Keep feed lots free from old machinery and obstacles that may bruise.

4. Do not feed grain heavily just prior to loading.

5. Bed with sand, free from stones, to prevent slipping.

6. Cover sand with straw in cold weather, but no straw for hogs in hot weather.

7. Wet sand bedding in summer before loading hogs, and while en-route. Drench when necessary.

8. Remove protruding nails, bolts, or any sharp objects in truck or car.

9. Have upper deck of truck high enough to prevent back bruises on calves below.

10. Use good loading chutes, not too steep.

11. Load slowly to prevent crowding against sharp corners, and to avoid excitement.

12. Use canvas slappers instead of clubs or canes.

Stop Milk Fever With Vitamin D

Feeding cows big doses of vitamin D just before they calve will prevent milk fever, tests at Ohio Experiment Station indicate. When J. W. Hibbs and W. D. Pounden fed it at rates of 5, 10 and 30 million units daily for 3 to 8 days before calving only 2 of 23 cows had milk fever. One of these had received 5 million, the other 10 million units, daily. Six of the cows that got 30 million units had had milk fever in previous lactations.

Two forms of vitamin D were used—irradiated yeast and an oil concentrate. Previously Hibbs and Pounden tried 1 to 5 million units daily for 2 to 4 weeks before cows calved, but this treatment wasn't effective. They now are trying to determine what dosage is best.

Studies to date show that in cows susceptible to milk fever both calcium and phosphorus in the blood decline during the week before calving. Calcium continues to fall for 2 days after freshening and phosphate for 1 day.

—Cappers Farmer

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—Maeterlinck

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